RECLAMATION

Managing Water in the West

Ainsworth Irrigation District
Draft Environmental Assessment

Long-Term Water Service Contract
Renewal/Conversion

U.S. Bureau of Reclamation
Nebraska-Kansas Area Office
Grand Island, Nebraska

May 2006

NIOBRARA RIVER

SNAKE RIVER

AINSWORTH CANAL

MERRITT DAM AND RESERVOIR

Snake River Falls

SAMUEL R. McKELVIE NATIONAL FOREST

FORT NIOBRARA NATIONAL WILDLIFE REFUGE

VALENTINE NATIONAL WILDLIFE REFUGE

Valentine Airport

Minnechaduza Creek

Steer Creek

Boardman Creek

Gordon Creek

Schlagel Creek

Big Alkali Lake

Hackberry Lake

Dewey Lake

Pelican Lake

Red Deer Lake

Evergreen Creek

Rush Creek

Dry Creek

North Fork Plum Creek

South Fork Plum Creek

Fairfield Creek

Wood Lake

Leach Lake

Cedar Creek

Johnstown

CONSUMERS PUBLIC POWER DISTRICT

K.L.I.S.K.V.

CHICAGO AND NORTHWESTERN

C.B.&Q.

Norden

Muleshoe Cr.

Middle Cr.

Chimney Cr.

Rock Cr.

SPRINGVIEW

KEYA PAHA CO.

BROWN CO.

CHERRY CO.

BROWN CO.

ROCK CO.

AINSWORTH IRRIGATION DISTRICT

LATERAL

AIRPORT LATERAL 52.6

LAT. 51.1

SAND DRAW LATERAL

BONE LATERAL

LAT. B-15.0

LAT. B-12.1

LAT. B-12.7

LAT. B-12.8

Plum Creek

Bone Creek

Long Pine Creek

Willow Creek

Draw

AINSWORTH

Long Pine

115 KV N.P.P.C.

R 31 W

R 30 W

R 29 W

R 28 W

R 27 W

R 26 W

R 25 W

R 24 W

R 23 W

R 22 W

R 21 W

R 20 W

T 35 N

T 34 N

T 33 N

T 32 N

T 31 N

T 30 N

T 29 N

101°00'

100°30'

100°00'

42°45'

EXPLANATION

BUREAU OF RECLAMATION
COMPLETED AND AUTHORIZED WORKS

- DAM AND RESERVOIR
- CANAL AND LATERAL
- SIPHON
- ★ AINSWORTH IRRIGATION DISTRICT HEADQUARTERS
- AREA BENEFITED BY PROJECT WORKS

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION - LM REGION
PICK-SLOAN MISSOURI BASIN PROGRAM
SANDHILLS DIVISION

AINSWORTH UNIT
NEBRASKA

Attachment 1

MAP NO. 719-705-2

5 0 5
SCALE OF MILES

1981

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Chapter 1
Purpose and Need

Introduction

The Federal action analyzed in this draft environmental assessment (DEA) is to renew or convert the Ainsworth Irrigation District's (AID) long-term water service contact. Renewal or conversion would be accomplished in an environmentally sound manner and with an appropriate balance of water uses.

Setting

The proposed Federal action in this DEA is to renew or convert the water-related contract for the Ainsworth Unit (Unit) with the Ainsworth Irrigation District (AID). The AID's current long-term water service contract with the United States expires on December 31, 2006.

The Unit was authorized for construction as part of the Pick-Sloan Missouri River Basin Project on August 21, 1954. Construction of Merritt Dam and Reservoir was initiated in August 1961 and completed in May 1964. The storage of water began in February 1964. The Nebraska Game and Parks Commission (Commission) manages fish, wildlife, and recreation at the reservoir. The Unit includes approximately 730 upland acres of Samuel R. McKelvie National Forest land which were withdrawn for Bureau of Reclamation (Reclamation) project purposes in Sections 25 and 26, Range 31 West, Township 31 North.

Major features of the Unit include Merritt Dam and Reservoir, the 52-mile Ainsworth Supply Canal, a 176-mile system of irrigation laterals, and surface/subsurface drains. All are operated and maintained by the AID. The Unit stores water to irrigate up to 35,000 acres in the AID; the AID currently serves approximately 34,539 acres of project lands. Although primarily a single purpose irrigation project, Merritt Reservoir also provides fish and wildlife, recreation, and water quality benefits.

The Unit is located in Cherry, Brown, and Rock counties (See Attachment 1). Merritt Dam impounds the Snake River some 14 miles upstream from its confluence with the Niobrara River in Cherry County southwest of the City of Valentine. The Ainsworth Canal travels 52 miles from the Merritt Dam outlet works through Cherry County to AID lands. These lands begin near Johnstown and continue eastward to near Long Pine, ranging 22 miles from west to east and 14 miles from north to south in Brown and Rock counties.

Background of Water Service Contract Renewal

The AID's long-term water service contract was entered into under Section 9(e) of the Reclamation Project Act of 1939 which limits the term to not longer than 40 years. The 1939 Act was supplemented by the 1956 Act. The 1956 Act provides that water service contracts which were entered into under Section 9(e) of the 1939 Act: (1) can be renewed for stated terms and conditions mutually agreeable to the parties; (2) can be converted to a contract under subsection (d) under stated terms and conditions mutually agreeable to the parties; and (3) have a first right to a stated share or quantity of the project's available water supply for beneficial use.

The AID has requested that their 9(e) long-term water service contract be converted to 9(d) repayment contract with a repayment period of 40 years. The AID would be required to repay the negotiated portion of the irrigation obligation within the repayment period of the contract. In situations where total repayment made by the irrigation district is not sufficient to repay the entire irrigation obligation, "aid to irrigation" (i.e., power revenues) would be responsible for paying any remaining balance.

Purpose of and Need for Action

The purpose of this Federal action is to renew or convert the AID's long-term water service contract. This action is necessary because the AID's existing long-term water service contract will expire on December 31, 2006. Reclamation is required by the Reclamation Act of 1956 to provide irrigation districts holding such contracts a first right to a stated share of the available water supply consistent with the authorized purposes of the Unit. There is also a need to balance the contractual obligations to the AID water users with the needs of fish and wildlife, recreation, and other beneficial uses in the project area.

Scoping and Issues

Reclamation conducted public scoping meetings in Ainsworth and Valentine on April 24-25, 2003. The purpose was to identify potentially significant issues associated the proposal to transfer ownership (referred to as "title transfer") of certain facilities of the Unit to AID. The meetings were attended by over 150 individuals. In addition, Reclamation held a technical meeting on May 8, 2003 in Ainsworth. This meeting was attended by Federal and state agencies and others associated with, or potentially impacted by, title transfer.

The AID is no longer pursuing title transfer to Merritt Dam and Reservoir and associated facilities. On February 16, 2005, the AID board passed a resolution requesting renewal or conversion of their long-term water service contract. Reclamation believes that much of the environmental data and public input collected for title transfer is relevant to the proposed contract/conversion renewal action, and would be useful in the environmental review process. The general concerns and issues identified during public scoping include:

- Protection of recreational interests;
- Water rights;
- Water levels in Merritt Reservoir;
- Water sales and hydropower;
- Potential effects that changes in hydrology would have on threatened and endangered species in the Niobrara River Basin;
- Water quality/contaminants;
- The relationship between annual irrigation drawdowns in Merritt Reservoir and its warm water fish population;

- Potential effects that status quo operations and potential changes in hydrology would have on trout populations in the lower Snake River; and

- Erosion, channelization, and down cutting within Sand Draw, Bone Creek, and Long Pine Creek.

In May 2005, Reclamation distributed a special edition of the Ainsworth Unit Bulletin newsletter notifying the public that the proposed title transfer action had been withdrawn and that Reclamation was initiating work on the renewal of the AID's long-term water service contract. The newsletter outlined the public involvement process that is being used during the National Environmental Policy Act (NEPA) and contract renewal/conversion process.

Chapter II
Proposed Action and Alternatives

Introduction

This chapter describes the proposed Federal Action and alternatives to that action, discusses alternatives considered but eliminated from further evaluation, and provides a table comparing environmental impacts of the alternatives at the end of the chapter (Table 1).

The alternatives considered in detail in this EA were developed using information gathered at public scoping meetings and technical meetings with the AID, from Federal and State agencies, and from comments submitted to Reclamation in response to the Ainsworth Unit Bulletin newsletter. These alternatives meet the purpose and need; agree with laws, regulations, and existing agreements; are governed by physical or economic limitations; and take into consideration the concerns and issues identified in Chapter 1. These alternatives meet water supply and other obligations to the AID, while providing opportunities for environmental and resource benefits in the Basin.

Alternatives Considered in Detail

Continuous Full Irrigation with No Change in Operation (No Action Alternative)

Under this alternative, the long-term water service contract with the AID would be renewed with no change in current and projected operation of Merritt Reservoir or the AID. The key elements of this alternative would be:

(1) The annual maximum water supply for the AID would be approximately 104,345 acre-feet (AF). This water supply would include reservoir storage from elevation 2946.0 feet to elevation 2886.0 feet (64,645 AF), plus an average net inflow to the reservoir during the irrigation season of approximately 39,700 AF. Net inflow was estimated by subtracting the average reservoir evaporation and seepage losses from the average reservoir inflow June 15-September 15.

The annual base water supply for the AID is 63,712 AF with a provision to purchase additional water if available. A "base water supply" is considered to be 16.5 inches of project water for AID irrigators. The average annual water supply (canal diversion) from 1968-2004 was 68,461 AF, or about 17.4 inches of water per acre. The historical maximum annual canal diversion was 91,601 AF in 1976.

(2) Full use of storage water at Merritt Reservoir based on irrigation demands with no minimum pool elevation.

(3) Implementation of water conservation practices currently described in the AID's water conservation plan. In August 2005, the AID updated their plan to include the following objectives:

- reduce seepage losses in laterals;
- encourage center pivot development of previously gravity irrigated land;
- reduce field runoff and nitrogen leaching and demonstrate efficient use of all sources of nitrogen and irrigation water;

- cost share funding and grants for water conservation and automation and repair of aging infrastructure; and
- continue to keep five year average delivery to farm percentage at 65 percent or better.

(4) No change in current and future operations of Merritt Reservoir. The AID would continue voluntary measures to benefit the existing fisheries in the Snake River below Merritt Dam.

Continue Irrigation with Increased Base Water Supply (Irrigation Alternative)

Under this alternative, the long-term water service contract with the AID would be renewed or converted with no change in the current and future operation of Merritt Reservoir. This alternative would be similar to the No Action Alternative, except for:

(1) The annual maximum water supply for the AID would be approximately 104,345 AF. It would include the reservoir storage from elevation 2946.0 feet to elevation 2886.0 feet (64,645 AF), plus an average net inflow to the reservoir during the irrigation season of approximately 39,700 AF.

The AID would not be required to purchase additional water when canal diversions exceeded a water supply of 63,712 AF.

(2) Full use of storage water at Merritt Reservoir based on irrigation demands with no established minimum pool elevation.

(3) The AID would agree to continue existing water conservation measures outlined in the No Action Alternative. In addition, the AID would implement further improvements to decrease return flows in Bone and Long Pine Creeks and Sand Draw.

Continue Irrigation with Fish, Wildlife, and Recreation Improvements (FWR Alternative)

Under this alternative, the long-term water service contract with the AID would be renewed or converted, and a minimum pool elevation of 2929.0 feet in Merritt Reservoir would be maintained. Maintaining a higher minimum water surface level would allow access to at least one boat ramp and provide additional boating/recreation benefits. Higher reservoir elevations would also benefit the reservoir fishery.

The key elements of this alternative are:

(1) The annual maximum water supply for the AID would be approximately 74,778 AF. This water supply would include the reservoir storage from elevation 2946.0 feet to elevation 2929.0 feet (35,078 AF), plus an average net inflow to the reservoir during the irrigation season of approximately 39,700 AF. In the 41 years that irrigation releases have been made from Merritt Reservoir for the AID, there have been 13 years when irrigation demands have dropped the reservoir pool below elevation 2929.0 feet.

(2) A minimum reservoir pool elevation of 2929.0 feet at Merritt Reservoir would be maintained to provide a surface elevation at least two feet higher than the bottom of the lowest boat ramp. This would ensure access to at least one ramp during low water periods.

(3) At the request of the Commission, the AID would provide water releases from Merritt Reservoir to the Snake River to maintain conditions to benefit brown and rainbow trout, water quality, wildlife, and

overall aquatic life in the river. The minimum pool elevation would be adjusted in response to these releases.

(4) The AID would continue to implement water conservation measures outlined in the No Action Alternative. In addition, the AID would implement other water conservation measures to improve district-wide efficiencies to reduce water supply requirements and decrease return flows in Bone and Long Pine Creeks and Sand Draw.

Alternative Considered but Eliminated from Detailed Analysis

No Contract Alternative —Under this alternative, Reclamation would not renew or convert the existing long-term water service contract with the AID. This alternative was considered and eliminated from detailed analysis for the following reasons:

(1) It would not meet the purpose of and need for the proposed Federal action.

(2) If this alternative were implemented, the AID would not have a project water supply and could not use the existing distribution system. Water stored in Merritt Reservoir would no longer be available to the AID for irrigation use. After five years of non-use, the AID's water right could be canceled by the State of Nebraska.

Storage space in Merritt could provide various options for uses other than irrigation. However, if the storage and use of the water were changed to any purpose other than that provided for in the authorizing legislation, reauthorization by Congress would be required.

(3) The AID has a right-to-renew clause in their existing water service contract.

(4) Reclamation is required by the Reclamation Act of 1956 to provide districts holding such a contract a first right to a share of the projects available water supply.

(5) The AID’s financial obligation to the United States would not be repaid.

Summary of Alternative Impacts

Impacts of the alternatives considered in detail are compared in Table 1.

Table 1. Summary Comparison of Alternatives (Change from No Action Alternative)

Resource	No Action Alternative	Irrigation Alternative	FWR Alternative
Water Supply (AF) [1]	104,345	104,345	74,778 (-29,567)
Average reservoir elevation end of August (feet)	2929.6	2928.6 (-1.0)	2932.1 (+2.5)
Average reservoir surface area end of August (acres)	1,482	1,429 (-53)	1,633 (+151)
District irrigated acres [2]	34,539	No change from the No Action Alternative	
Agriculture			
District-wide average annual farm benefits	$930,000	$971,000	$859,000
Recreation			
Total annual visits	133,000	131,000	137,850
Total annual value	$5.62 million	$5.54 million	$5.82 million
% Change in visits and value from No Action Alternative	N/A	-1.5%	+3.64%
Other Impacts			
Regional economics	No significant project-related impacts are expected to the local economy		
Reservoir fisheries	No change from current condition	Slight reduction in surface area in the months of June through November (-39 average surface acres) when compared to No Action Alternative	Slight increase in surface area in the months of June through November (+96 average surface acres) when compared to the No Action Alternative
Snake River fisheries	No significant project-related impacts are expected.		

[1] Includes reservoir storage and net inflow during the irrigation season
[2] Approximate acreage currently receiving irrigation

There will be no change from the No Action Alternative

Resource	No Action Alternative	Irrigation Alternative	FWR Alternative
Water quality	No significant project-related impacts are expected. There will be no change from the No Action Alternative.		
Wildlife and habitat	Minor changes in reservoir riparian habitat due to annual reservoir fluctuations. No change in upland habitat acres	Same as the No Action Alternative	Same as the No Action Alternative
Migratory birds	Waterbird habitat subject to seasonal reservoir fluctuations. No change to upland grassland habitat.	Impacts similar to No Action Alternative for waterbird, tree, shrub-, and grassland-nesting migratory birds	Improved habitat conditions for migrating waterbirds when compared to the No Action Alternative. Impacts to tree, shrub and grassland-nesting migratory birds similar to the No Action Alternative
Wetlands	No change from the No Action Alternative is expected		
Riparian vegetation	No change from the No Action Alternative is expected		
Federally listed endangered species	No anticipated impacts to T&E species.	No anticipated impacts to T&E species.	Larger reservoir surface area and increased releases may benefit bald eagle and western prairie fringed orchid. No anticipated impacts to T&E species.
Cultural resources and Sacred Sites	No change from the No Action Alternative is expected		
Indian Trust Assets	No change from the No Action Alternative is expected		
Environmental Justice	No change from the No Action alternative is expected		

Chapter III
Affected Environment and Environmental Consequences

Introduction

This chapter describes the affected environment (i.e. existing conditions), environmental consequences (impacts of the alternatives compared to the No Action Alternative), and environmental commitments (mitigation of impacts) associated with renewing or converting the AID's long-term water service contract.

After describing the project area, resources that have been determined to be minimally affected by contract renewal or conversion are discussed, including project operations, water supply, and agricultural economics. Resources that would be largely unaffected are described next, including fisheries, water quality, wildlife and habitat, migratory birds, wetlands, riparian vegetation, recreation, Federally-listed threatened or endangered species, cultural resources, Indian trust assets (ITA), and sacred sites, and environmental justice.

Project Area

The Unit, located in north-central Nebraska, provides a full water supply to irrigate up to 35,000 acres of land in the AID. Project facilities include Merritt Dam and Reservoir, the Ainsworth Canal, a system of laterals, and surface and subsurface drains. The project facilities are operated and maintained by the AID. The irrigable lands extend 22 miles from west to east and 14 miles from north to south, beginning near Johnstown in Brown County and continuing eastward to a point near Long Pine in Rock County.

Merritt Reservoir—the project's storage facility—is located on the Snake River approximately 14 miles upstream from its confluence with the Niobrara River southwest of Valentine. The Commission administers 350 acres of recreation land and 5,797 acres of wildlife land at Merritt Reservoir for recreation, fish, and wildlife purposes. At the top of the conservation pool (elevation 2946.0 feet) the reservoir has 44 miles of shoreline, 66,726 AF of storage, and a surface area of about 2,909 acres. It provides water for irrigation, recreation, and fish and wildlife resources, all of which play an important role in the local and regional economies.

Resources Analyzed in the Draft EA

The resources and issues analyzed in this DEA were identified by Reclamation staff and through the public scoping process. Resources are categorized as: (1) minimally-affected by contract renewal or conversion, and (2) those believed to be largely unaffected by contact renewal or conversion. The specific resources and issues discussed in this chapter are:

Resources Minimally-Affected by Contract Renewal or Conversion:

- Project operations and water supply;
- Agricultural economics - income and employment.

Resources Largely Unaffected by Contract Renewal or Conversion:

- Fisheries;
- Water quality;
- Wildlife and habitat;
- Migratory birds;
- Wetlands;
- Riparian vegetation;
- Recreation;
- Federally listed threatened or endangered species;
- Cultural resources, Indian trust assets and sacred sites;
- Environmental justice.

This DEA does not analyze resources when it is reasonable to assume that renewing or converting the AID's long-term water service contract would not impact these resources, i.e. soils, air quality, noise, water rights, etc.

The development of hydropower at Merritt Dam was identified as a concern during the scoping meetings. The public's concern stems from the fact that the Federal Energy Regulatory Commission (FERC) issued a three-year preliminary permit to Merritt Hydro LLC to study a proposed Merritt Dam hydroelectric project. Merritt Hydro LLC has since petitioned FERC to accept voluntary surrender of the preliminary permit. FERC issued a "Notice of Surrender of Preliminary Permit," dated October 8, 2003. The Ainsworth contract renewal/conversion DEA will thus not analyze the potential for impacts associated with hydropower development at this time because there is no hydropower proposal for Merritt Dam. Any future Merritt Dam hydropower proposal would be subject to a NEPA compliance and FERC permitting procedures.

Resources Minimally Affected by Contract Renewal or Conversion:

Project Operations and Water Supply—Merritt Dam impounds the Snake River just downstream of its confluence with Boardman Creek. Water stored in Merritt Reservoir for scheduled releases into the Ainsworth Canal is conveyed to project lands for irrigation. The river originates in the Sandhills region of Nebraska, an area characterized by highly-permeable sands and many closed basins. The total drainage area contribution to the Snake River above Merritt Reservoir is about 600 square miles. Of this, only 83 square miles directly contribute to surface runoff.

A gage is located on the Snake River near Burge, Nebraska, approximately two miles below Merritt Dam. Snake River flows have been recorded at this site since June 1947. The average annual flow in the river for 1948-1963 was 184,500 AF. The filling of Merritt Reservoir began in 1964. The average annual flow in the Snake River near Burge for 1964-2004 was 113,200 AF (Figure 1). The average annual diversion into Ainsworth Canal is 68,461 AF.

Merritt Dam is a zoned earth-filled embankment that has a height of 126 feet and a crest length of 3,222 feet. It has a morning glory ungated spillway with a capacity of 2080 cubic feet per second (cfs) at elevation 2949.8 feet mean sea level (msl). The reservoir has an active conservation space of 62,064 AF.

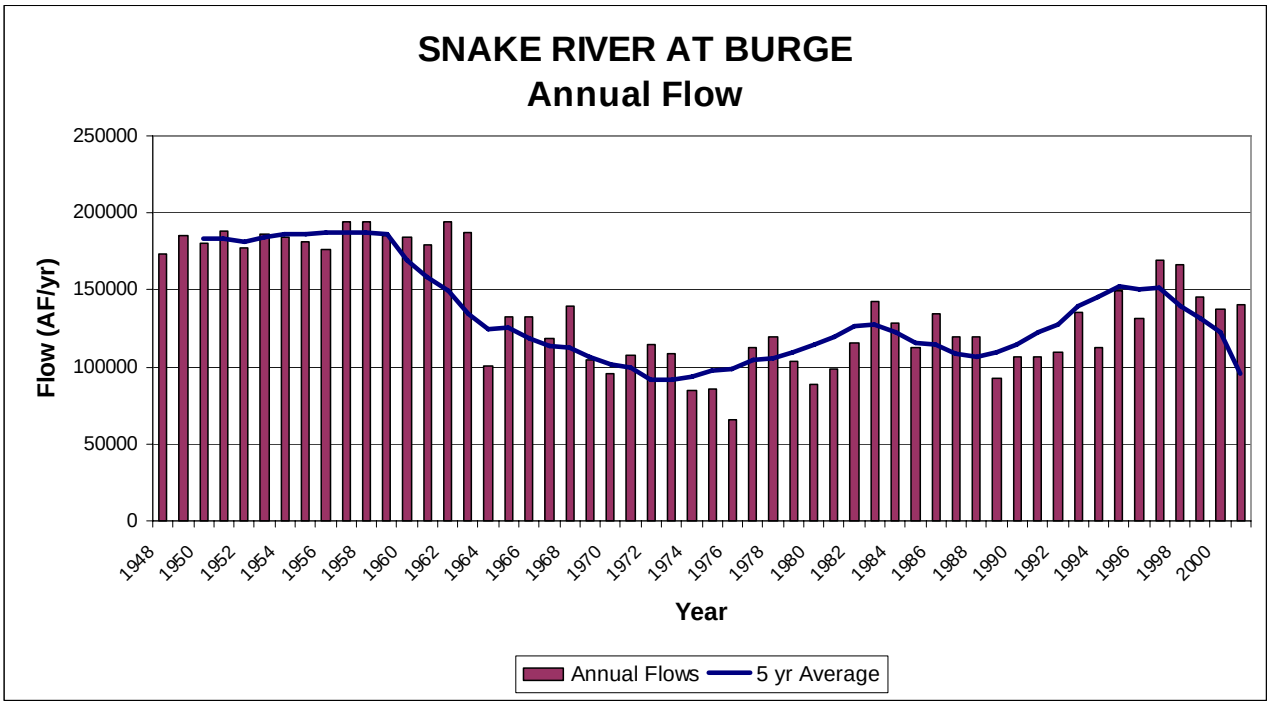


Figure 1. Annual Flow in the Snake River at Burge, Nebraska (1948-2004)

This space is used for irrigation, as well as providing for recreation, and fish and wildlife enhancement (Figure 2). The irrigation supply to the AID includes the space from the top of the active conservation pool to the Ainsworth Canal outlet elevation of 2886.0 feet (64,645 AF).

The AID's water supply is that part of the total water supply of the Snake River available through Unit works from the natural flow and from storage in the reservoir as appropriated under Nebraska law for use on AID's lands, not to exceed beneficial use. The United States holds the storage and storage use rights in Merritt Reservoir for the Unit. The storage rights are for 74,486 AF, with a priority date of November 1958. The storage use rights priority date is April 1965. The storage and storage use rights are sufficient to cover all project land within the district. The AID holds the natural flow rights, with the initial flow right of March 1953. The natural flow rights are sufficient to cover all project land within the irrigation district.

For much of the year, Merritt Reservoir is operated as a flow-through system, with releases from the reservoir to the Snake River approximating inflows. Inflows into Merritt Reservoir are fairly constant; the reservoir can quickly recover after irrigation season to the top of the conservation pool. Average flows of the Snake River directly above Merritt Reservoir are approximately 182,000 AF annually. Of this flow, an average of 42,400 AF are diverted into the Canal, and the remaining flow is either stored in Merritt Reservoir, lost to evaporation and seepage, or allowed past the reservoir into the Snake River.

Total annual diversions into the Ainsworth Canal are approximately 75,000 AF. This supply is made up of the approximately 42,500 AF of diverted natural flow as stated above, with the rest provided by reservoir storage. The AID has the right to divert the entire 66,726 AF of conservation storage plus the direct flows, always sufficient in the past to meet project demands. Their irrigation demand is most influenced by precipitation and temperature during the growing season.

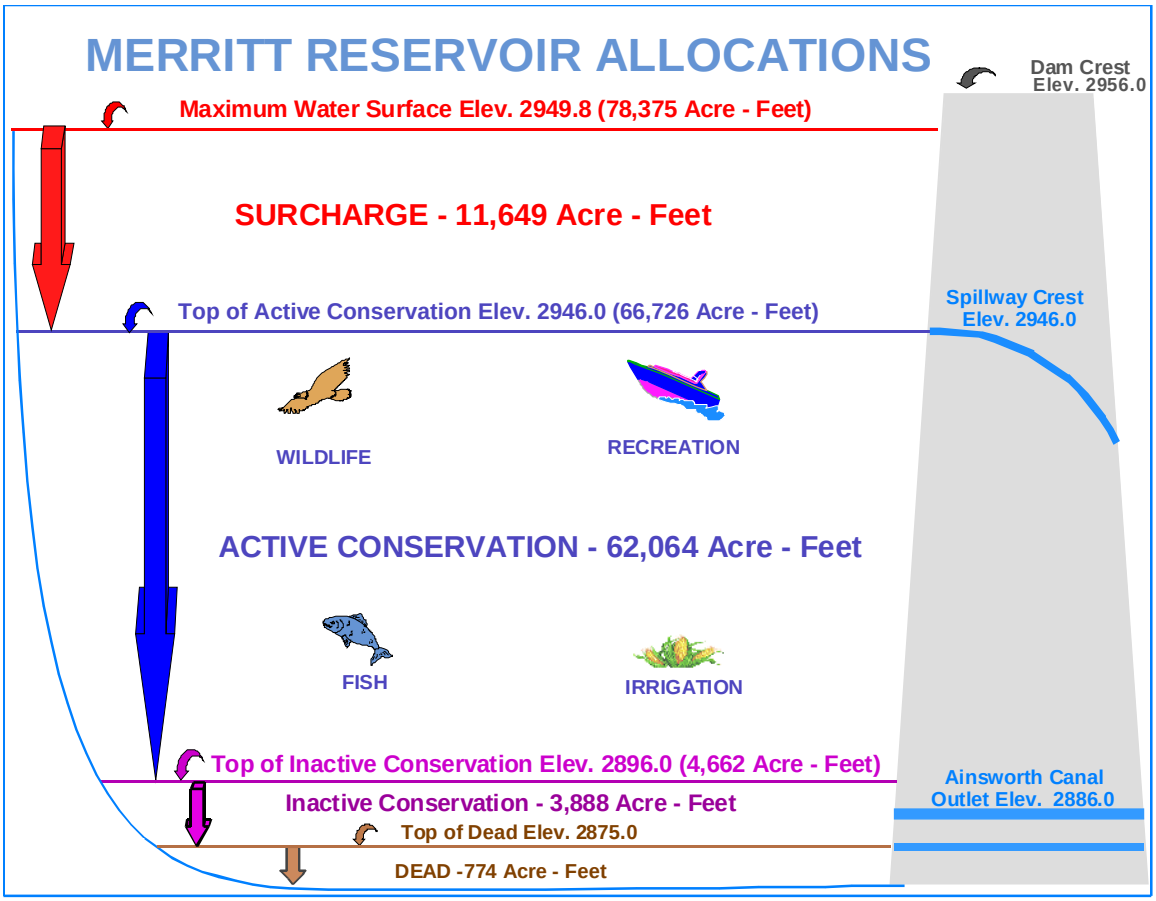
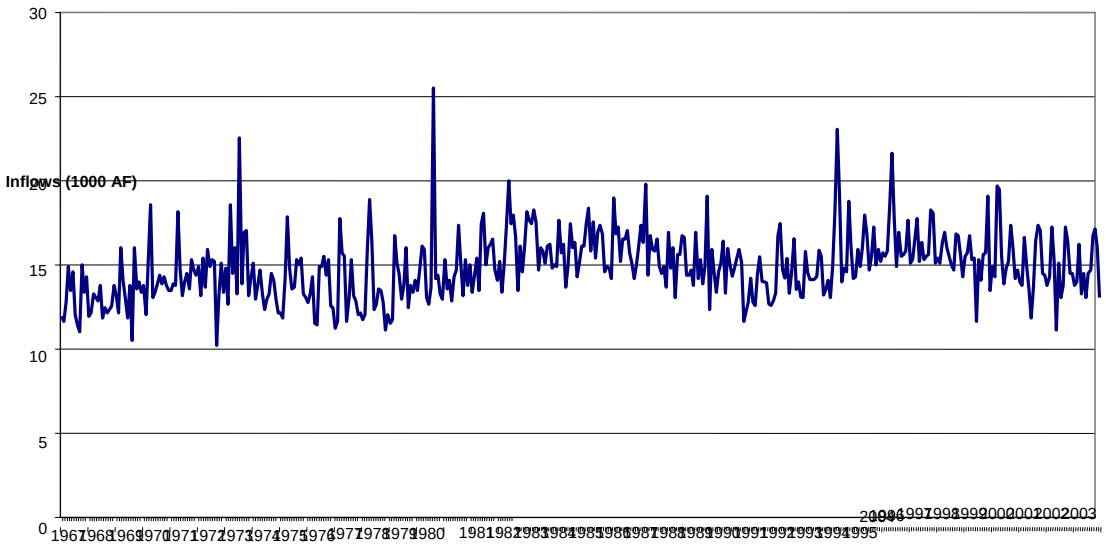


Figure 2. Merritt Reservoir Allocations

Merritt Reservoir is filled each fall following the irrigation season to elevation 2944 feet msl, with minimal or no releases to the Snake River. The reservoir's surface area covers about 2,909 acres at elevation 2946.0 feet msl. "Seepage gain" and toe drain flow normally produce flows up to 15 cfs below Merritt Dam when releases are not otherwise being made to the Snake River. This wintering level of the reservoir is two feet below the top of conservation pool and within the repaired area of soil cement on the upstream face of the dam. The reservoir is regulated to maintain this level until the ice on the reservoir melts each spring. Maintaining the reservoir at this elevation during the winter avoids ice damage to the older soil cement at lower elevations on the dam. Upon "ice out," the outlet pipe is drained, inspected, and repaired as necessary.

The filling process of the remaining two feet generally takes place in April. The reservoir is filled to elevation 2946 ft msl to reduce shoreline erosion around the reservoir and to minimize sand accumulation on the face of the dam. During early spring and late fall the AID attempts to make at least a 75 cfs release to the Snake River below Merritt Dam from April-June. The spring reservoir elevation is maintained until irrigation releases begin to draw on the conservation pool. Releases to the river may be temporarily stopped when downstream landowners need to move livestock to pastures on the opposite side of the Snake River. Once a landowner makes a request to the AID, flows are gradually reduced over a period of several hours to allow fish to seek deeper pools of water, thereby preventing them from becoming stranded on exposed river bars.

Since the reservoir was constructed in 1964, the average annual computed inflow to the reservoir from the Snake River and Boardman Creek is 181,700 AF. The highest annual computed inflow occurred in 1997 when 204,600 AF flowed into the reservoir. The minimum annual computed inflow of 156,300 AF was recorded in 1968. Snake River flows in this reach of the river are very consistent because it is largely a groundwater-dominated watershed. The reservoir typically fills each year allowing for a full service irrigation supply to the AID. Graph 1 displays the average monthly computed inflows into Merritt Reservoir. The mean, maximum and minimum monthly computed inflows into Merritt Reservoir are shown in Graph 2.



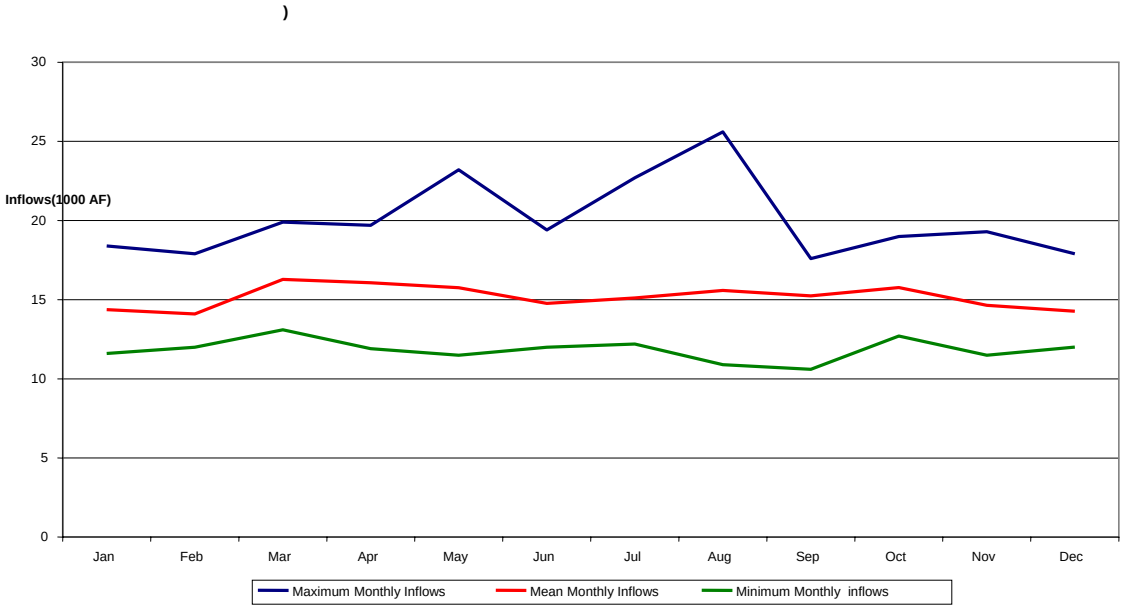
Graph 1. Merritt Reservoir – Average Monthly Computed Inflows in Acre-Feet

Ainsworth Canal originates at the Merritt Dam outlet works in Cherry County, extending eastwards through the Sandhills to AID lands in Brown and Rock Counties. The canal is concrete-lined for the entire length to minimize seepage losses in the sand. The canal has an initial capacity of 580 cfs. The lateral system has a total length of about 170 miles, and capacities range from 4-530 cfs. Five miles of surface water disposal drains and several disposal ponding areas have been constructed.

Irrigation releases into the canal normally begin in May, continuing through mid-September when releases are reduced or discontinued. Approximately 68,461 AF is released directly into the Ainsworth Canal annually; however, the AID maintains the right to divert the entire 64,645 AF in reservoir storage, plus reservoir inflows during the irrigation season. Inflows into Merritt Reservoir are nearly constant and the reservoir typically recovers to full pool each year (U.S. Bureau of Reclamation 1995).

Precipitation, temperature, length of growing season, wind, humidity, and soil moisture are a few of the variables that influence the AID's irrigation requirements. However, year-to-year differences in annual precipitation and temperature are probably most responsible for the annual variance in irrigation demand and Merritt Reservoir's seasonal drawdown.

The AID's routine operation and maintenance (O&M) activities include: (1) repairing, sealing, and replacing concrete lining on the Ainsworth Canal, (2) repairing boundary fence, (3) mulching sand blowouts in the fence line and along the canal, (4) checking trash racks, (5) burying pipe laterals, and (6)



Graph 2. Merritt Reservoir Monthly Computed Inflows – Mean, Maximum and Minimum

cleaning and shaping ditches where needed. The canal is treated two times each month with an aquatic herbicide to control moss accumulation on the trash racks. Annual terrestrial weed control is done by the use of chemicals, mowing, and burning.

Determination of Present Level Inflows to the Reservoir – Based on information provided in Reclamation's 1999 Missouri River Depletion Analysis, there are no significant depletions in the upper Snake River Basin. There are no indications of future irrigation development in this basin. Therefore, the historic inflows into Merritt Reservoir were assumed as present level inflows for this analysis.

A reservoir operations model (ROM) used in this analysis was a PC-based model developed especially for operation of Merritt Reservoir. This was a variation of the standard ROM model used in Reclamation for the prediction of monthly operations. The simulation is a monthly time-step model: input data were required for the inflow, evaporation, seepage, canal and lateral losses, and crop consumptive-use requirements. Using these data and target end-of-month reservoir elevations, the model attempts to meet all demands. If demands cannot be met without violating target elevations, then the irrigation demand is reduced, thus invoking an irrigation shortage.

Input data for the ROM model were taken from historical records provided by the McCook Field Office. These included reservoir inflows, evaporation, seepage loss estimates, main canal and laterals losses, and water delivered to the crop.

The historical data were used as model inputs, with the results compared to the historic monthly reservoir elevations and the flows in the river below the dam. The historical and the simulation model matched within 5 percent, and thus were deemed acceptable for analysis of the alternatives.

Monthly evaporation factors were based on data received from the McCook Field Office. The rates of evaporation, as they relate to surface area, were used to compute monthly evaporation. Based on data from the McCook Field Office, a monthly seepage rate of 15 cfs below the dam was used.

In 2003, a field survey by the Sedimentation Group of Denver's Technical Service Center included an underwater survey of the reservoir. Based on this information, a new set of area-capacity table and curves were established for Merritt Reservoir. The report was published in September, 2004, becoming effective on January 1, 2005. These data were used to compute reservoir elevations and capacities.

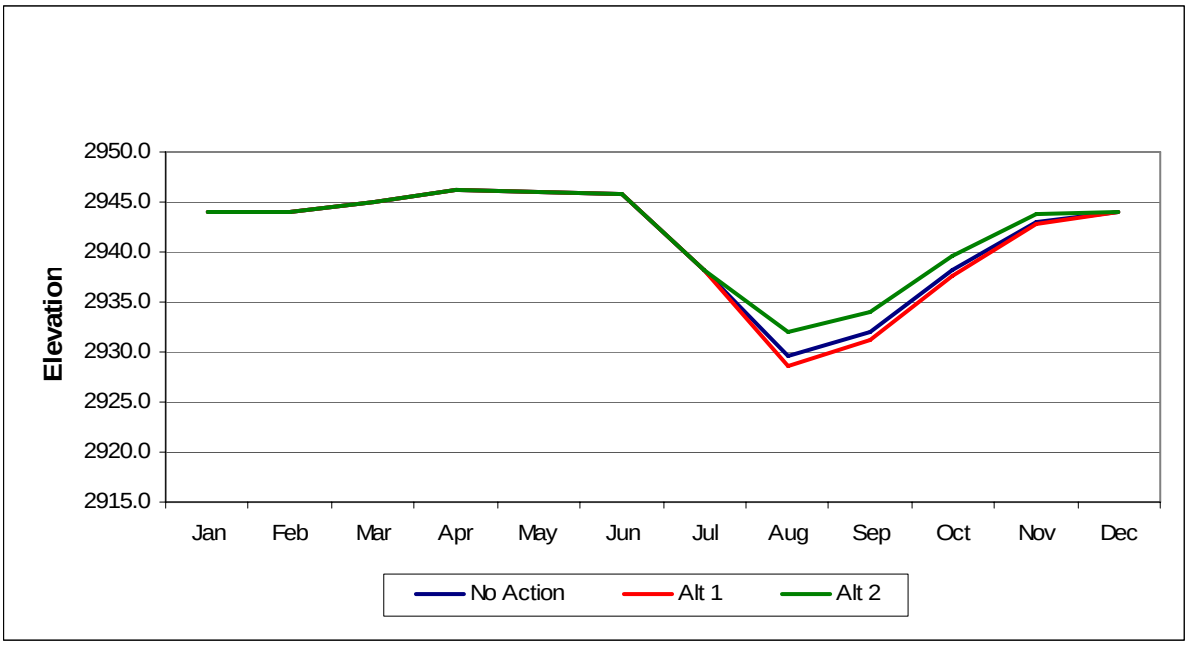
During April-September, water is released from Merritt Reservoir to provide a full service water supply for up to 35,000 acres in the AID. Table 2 shows average monthly diversions to the AID.

April	57 AF
May	2,678 AF
June	5,960 AF
July	27,040 AF
August	25,820 AF
September	6,906 AF
Total	**68,461 AF**

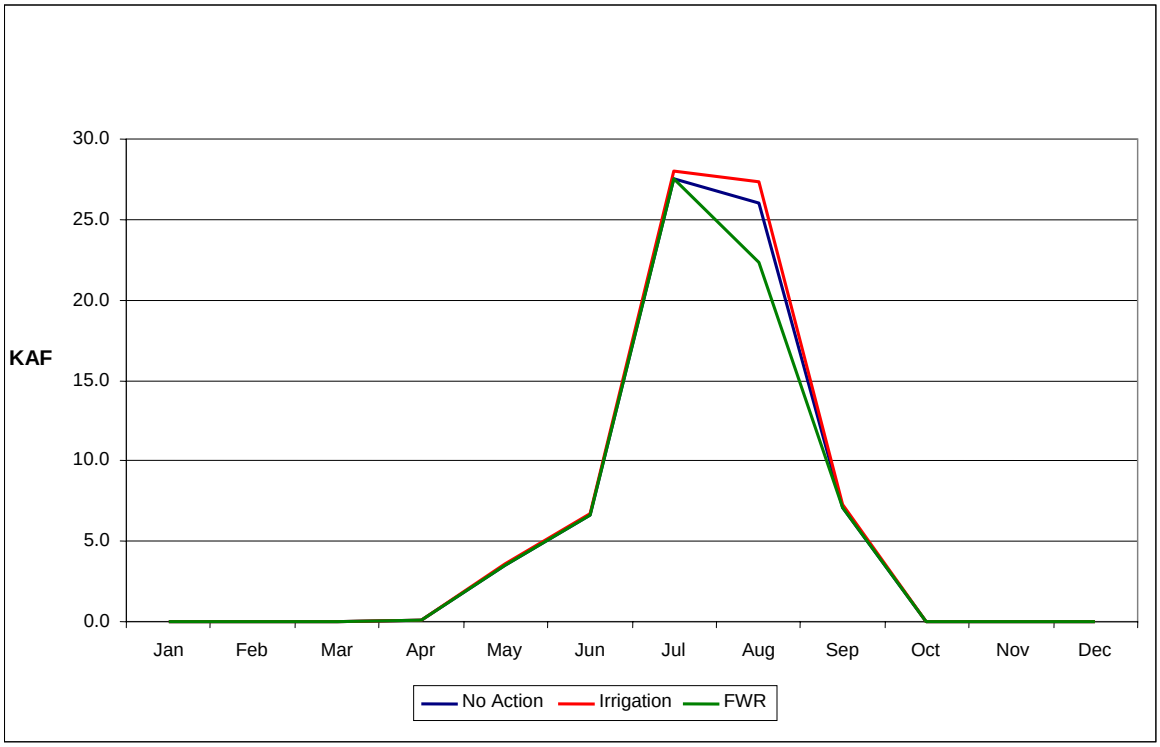
Table 2. Average Monthly Diversion to AID (1968-2004)

Data for the Ainsworth Canal and lateral conveyance losses were obtained from historical records provided by the McCook Field Office. Data for the AID's monthly irrigation requirement were obtained from historic data provided by the McCook Field Office. These data were used in conjunction with the lateral and Ainsworth Canal losses to determine the total irrigation demand at the headworks of the Ainsworth Canal.

Environmental Consequences: Project Operations and Water Supply—A comparison of reservoir elevations by alternative is shown in Graph 3. Ainsworth Canal diversions for each alternative are depicted in Graph 4.



Graph 3. Merritt Reservoir Elevations – Comparison of Alternatives

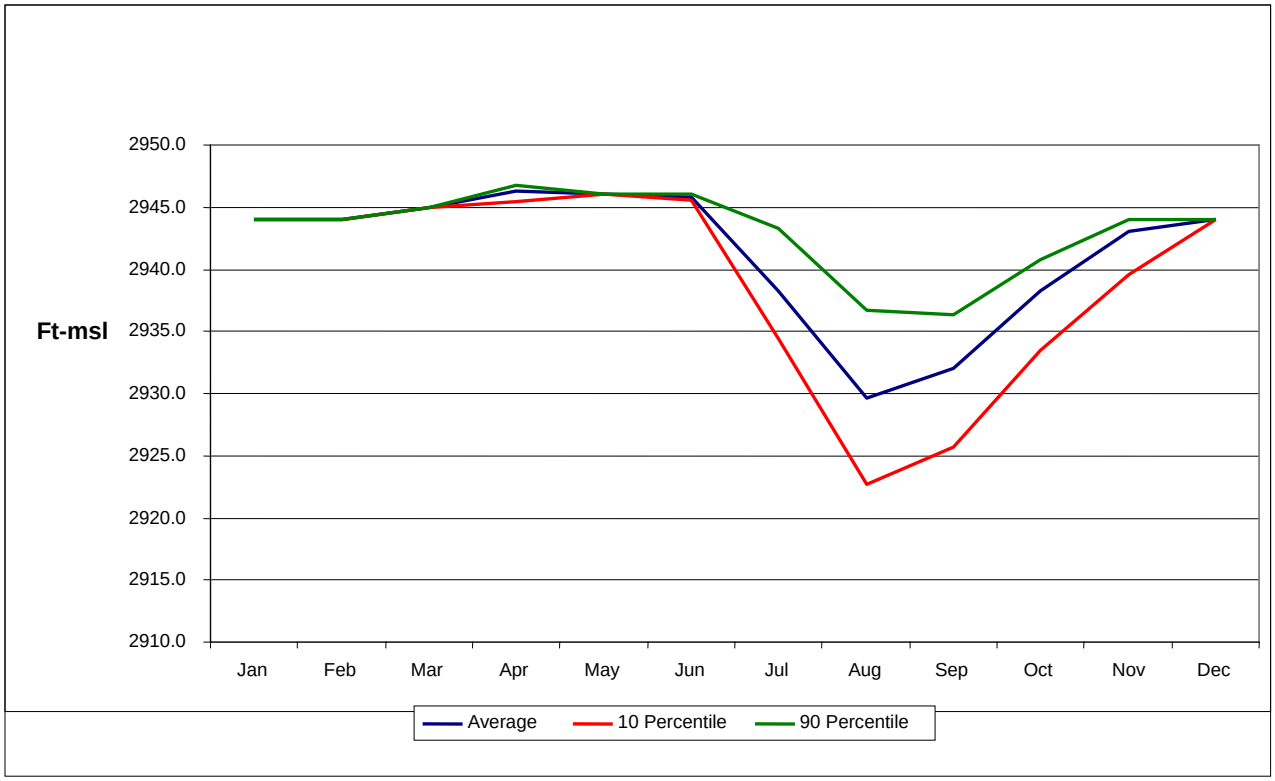


Graph 4. Merritt Reservoir, Ainsworth Main Canal Diversions – Comparison of Alternatives

From a hydrology standpoint, there would be no significant differences between the three alternatives concerning reservoir elevations and canal diversions. The upper Snake River drainage basin, in conjunction with groundwater base flow, provides sustained inflows to the reservoir regardless of the precipitation that occurs during the year.

The end-of-month reservoir elevations were established by calculating the releases to the Ainsworth Canal, on-farm deliveries, and releases to the Snake River. The average is defined as the arithmetic average for the period of record; the 10th percentile means that 90 percent of the time an elevation would be higher than the average; and the 90th percentile means that 10 percent of the time an elevation would be higher than the average.

No Action Alternative: The No Action Alternative was modeled using the existing river and reservoir system under the present level of flow conditions. No Action would provide for continuous full irrigation with no changes in operations. This would mean a base water supply of 63,712 AF, with provision for the AID to purchase additional water if available. The maximum water supply for the AID would be approximately 104,345 AF (64,645 AF in reservoir storage, plus approximately 39,700 AF of reservoir inflow during the irrigation season). Reservoir elevations for the No Action Alternative (average, 10th percentile, and 90th percentile) are shown in Graph 5.

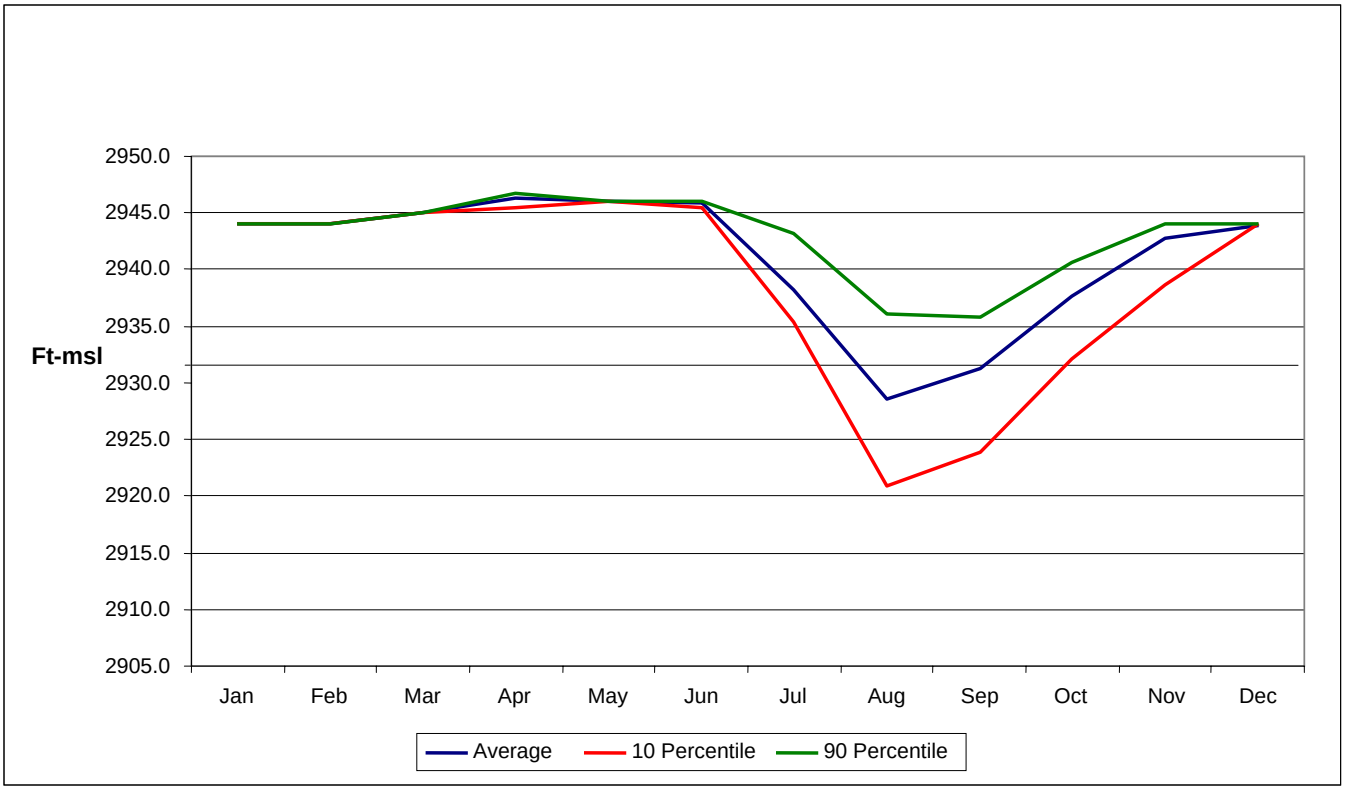


Graph 5. Reservoir Elevations – No Action Alternative

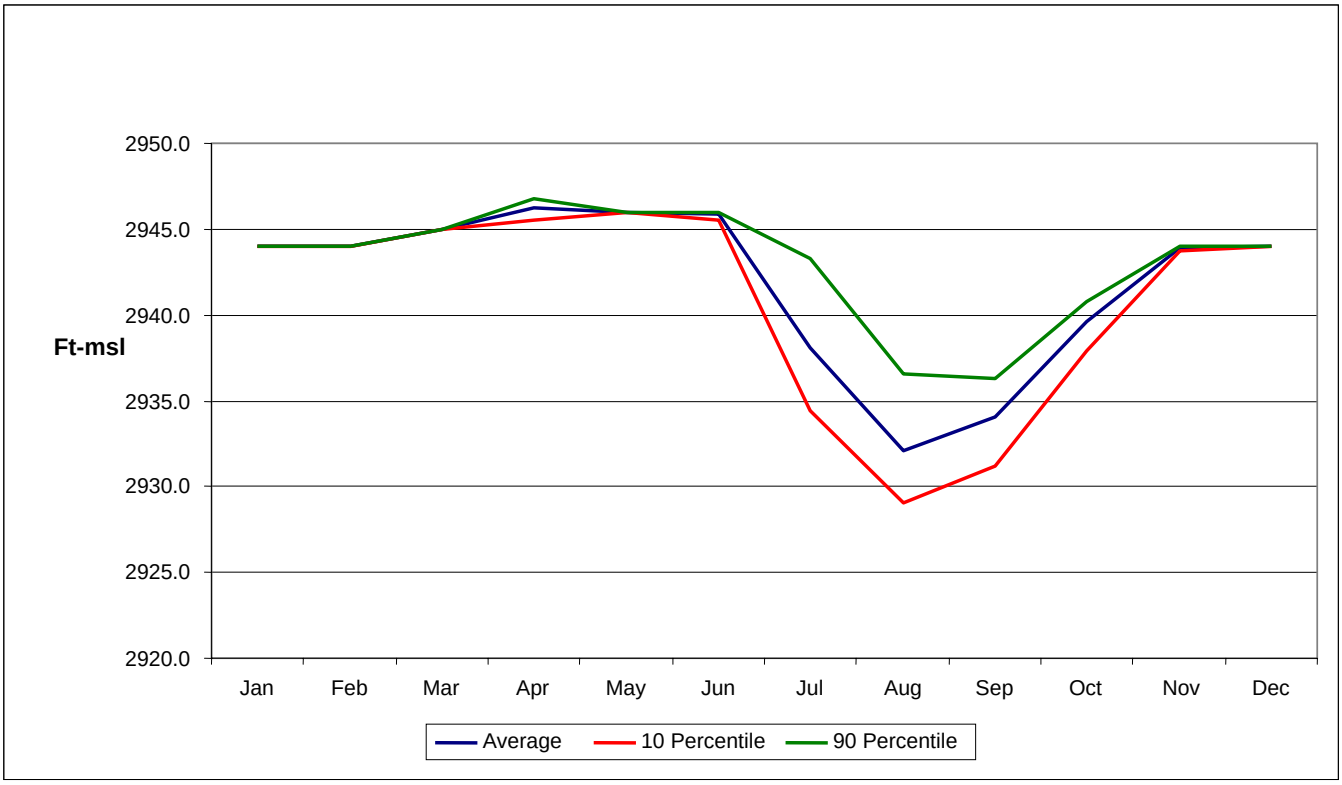
Irrigation Alternative: This alternative would provide the AID with a maximum water supply of approximately 104,345 AF (64,645 AF in reservoir storage, plus approximately 39,700 AF of reservoir inflow during the irrigation season). No additional purchase of water would be required from the AID when canal diversions exceeded 63,712 AF. The AID would have full use of storage water at Merritt Reservoir based on irrigation demands with no minimum pool elevations. The reservoir elevations for this alternative (average, 10th percentile, and 90th percentile) are shown on Graph 6.

FWR Alternative: This alternative would provide the AID with a maximum water supply of approximately 74,778 AF (35,078 AF in reservoir storage, plus approximately 39,700 AF of reservoir inflow during the irrigation season). This combined volume is comparable to the amount currently being provided to the AID. The minimum pool elevation for end-of-August would be established at elevation 2929.0 feet (31,648 AF) and would reduce the time it took to refill the reservoir. The minimum pool elevation would allow access to at least one boat ramp during the irrigation season for recreational benefits. The reservoir elevations for the FWR Alternative (average, 10^{th} percentile, and 90^{th} percentile) are shown on Graph 7.

There would be no significant impacts on the operation of the system from a hydrology standpoint for either the Irrigation or FWR Alternatives. The upper Snake River drainage basin provides sustained inflows to the reservoir regardless of precipitation. Precipitation, in conjunction with groundwater base flow, provides substantial flow to the reservoir.



Graph 6. Reservoir Elevations – Irrigation Alternative



Graph 7. Reservoir Elevations – FWR Alternative

The available flow into the reservoir and the reservoir storage provides a full water service supply to the AID each year. Even in the driest years, there is sufficient flow from the upper Snake River drainage to meet irrigation demands and refill the reservoir to the top of active conservation in the following year. Irrigation shortages are not common in the drainage.

Agricultural Economics—The AID lies within three counties: Brown, Cherry, and Rock counties. Merritt Dam and Reservoir and most of the Ainsworth Canal are in Cherry County. The AID's lands are in Brown and Rock Counties. These counties, in north-central Nebraska, encompass about 8,246 square miles.

The total population of the three counties is 11,429 people, with 3,525 residing in Brown County, 6,148 in Cherry County, and 1,756 in Rock County. These counties account for almost 11 percent of the total land area of Nebraska (77,354 square miles), but less than 1.0 percent of the state's total population of 1,711,263 people (U.S. Department of Commerce 2000). Urban dwellers made up 24 percent of the counties' population, with the remaining 76 percent of the total population being rural.

Farming was listed as the primary occupation for most of the farmers n Brown and Rock Counties. However, almost one-half of the farmers in Brown County and 40 percent of the farmers in Rock County obtained some of their annual income off-farm. The 1997 Census of Agriculture (U.S. Department of Commerce) was used as an indicator of the primary crops grown in Brown and Rock Counties. The primary crops in Brown County are corn, soybeans, hay and a small amount of oats. Rock County had corn, soybeans, and hay as their primary crops.

The market value of agricultural products sold (average per farm) came to $250,341 for Brown County and $176,043 for Rock County in 1997. In that same year, the total average market value of all agricultural products sold came to $87.37 million and $55.63 million for Brown and Rock Counties, respectively.

Corn is the most commonly produced crop in Brown and Rock Counties, accounting for 78 percent and 60 percent of all irrigated crops grown in Brown and Rock Counties, respectively. Soybeans were a commonly produced crop in Rock County, accounting for 37 percent of irrigated crops grown. Table 3 shows the irrigated crops produced in Brown and Rock Counties from 1997-2001 and the number of acres of each crop harvested. Crop yields were also obtained for each of the above crops and are shown in Table 4.

The primary crops in the AID include corn, corn silage, soybeans, and alfalfa hay. According to the AID's records, corn (on average) is produced on 23,570 acres. Corn silage is produced on 4,267 acres, and there are 5,850 acres of soybeans and about 650 acres of alfalfa hay. The AID accounts for 33.7 percent of all irrigated corn production in Brown and Rock Counties. Corn silage accounts for about 95 percent of all irrigated corn silage production for the two-county area. Soybeans grown in the AID account for 29 percent of all irrigated soybean acreage. Alfalfa hay is produced in the AID but makes up a very small percentage of the total alfalfa hay acreage in the two counties.

Yields for the crops grown in the AID are generally slightly higher than the county average yield reported by the Nebraska Agricultural Statistics Service. Corn yields in the AID averaged about 155 bushels per acre, corn silage yields averaged about 24 tons per acre, soybeans averaged about 50 bushels per acre, and alfalfa hay averaged about 4.65 tons per acre.

Crop and County	ACRES HARVESTED 1997	1998	1999	2000	2001	5-YEAR AVG
Corn Grain (bu)						
Brown	43,700	39,900	37,700	34,000	32,600	37,580
Rock	27,600	24,000	18,200	20,200	18,900	21,780
Corn Silage (ton)						
Brown	2,900	2,400	2,500	1,900	1,600	2,260
Rock	N/A	N/A	N/A	500	N/A	N/A
Soybeans (bu)						
Brown	3,300	3,000	5,600	7,000	10,000	5,780
Rock	10,000	11,700	14,700	14,700	16,400	13,500
Alfalfa Hay (ton)						
Brown	2,300	2,400	2,500	2,400	2,600	2,440
Rock	1,400	1,300	1,400	1,400	1,100	1,320

Table 3. Primary Irrigated Crop Acreages for Brown and Rock Counties in Nebraska, 1997-2001

Crop	CROP YIELD 1997	1998	1999	2000	2001	5-YEAR AVG
Corn Grain (bu)						
Brown	144.0	157.0	154.0	149.0	149.0	150.6
Rock	141.0	147.0	150.0	156.0	160.0	150.8
Corn Silage (ton)						
Brown	20.0	21.5	19.0	18.0	19.0	19.5
Rock	N/A	N/A	N/A	19.0	N/A	
Soybeans (bu)						
Brown	53.0	54.0	56.0	52.0	52.0	53.4
Rock	52.0	48.0	52.0	50.0	49.0	50.2
Alfalfa Hay (ton)						
Brown	3.29	4.6	3.6	4.0	4.0	3.9
Rock	3.31	3.7	4.5	4.5	3.9	3.98

Table 4. Crop Yields for Brown and Rock Counties in Nebraska, 1997-2001

Irrigation benefits for the Ainsworth Unit were estimated using a farm budget methodology for National Economic Development (NED) benefits as prescribed by The "Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies" (Principles and Guidelines). Detailed methodologies for determining irrigation benefits are shown at the end of this report.

Hydrologic model outputs were used to calculate annual irrigation benefits values and compare them to the No Action Alternative. The hydrologic comparison of irrigation water deliveries was performed for

an average over the period of record and for the 10th percentile and the 90th percentile of deliveries over the period of record (1968-2004).

Cross-comparisons between the average, 10th percentile, and 90th percentile were not done. For example, the No Action Alternative's average year was not compared to the Increased Water Supply Alternative's 10th percentile results, or the Fish and Wildlife Alternative's 90th percentile scenario. Instead, the 10th percentile and the 90th percentile results were compared across each Alternative. Lost benefits were estimated as the change in benefits from the No Action Alternative to the selected Alternative using the appropriate percentile (average, 10th, or 90th) for each Alternative.

Environmental Consequences: Agricultural Economics—Table 5 shows irrigation deliveries to the farms for the average, 10th percentile, and 90th percentile over the period of record. Also shown is the number of acre-feet per acre, the calculated irrigation benefits. and the change in irrigation benefits on an annual basis.

Alternative	Hydrologic Percentile	Deliveries (AF)	AF/AC	Calculated Benefits	Annual Difference In Benefits
No Action	Average	49,170	1.42	$ 930,000	
	10th	37,660	1.09	$ 712,000	
	90th	62,180	1.80	$1,176,000	
Irrigation	Average	51,319	1.49	$ 971,000	$ 41,000
	10th	39,960	1.16	$ 756,000	$ 44,000
	90th	63,880	1.85	$1,208,000	$ 32,000
Fish, Wildlife, and Recreation	Average	45,446	1.32	$ 859,000	($71,000)
	10th	37,660	1.09	$ 712,000	$0
	90th	53,240	1.54	$1,007,000	($169,000)

Table 5. Farm Irrigation Deliveries by Percentile, Annual Irrigation Benefits, and Annual Difference in Benefits by Alternatives When Compared to the No Action Alternative

No Action Alternative: As can be seen in Table 4 under the No Action Alternative, an average of 49,170 AF of irrigation water would be delivered to farms. Under the 10th percentile, farm deliveries would drop to 37,660 acre-feet. Farm deliveries would increase to 62,180 acre-feet under the 90th percentile.

Under the No Action Alternative 49,170 AF of water would be delivered to farms within the AID, on average. This equates to 1.42 AF per acre if the base acreage of 34,539 acres (project lands currently being served) were used. Therefore, the base annual irrigation benefit would be $930,481 ($26.94 per acre times 34,539 acres), rounded to $930,000. The base annual irrigation benefit can be transformed into a per AF basis by dividing $930,000 by 49,170 AF. When this is done, the benefit on a per AF basis would be $18.91 for the analysis.

Irrigation Alternative: Under the Irrigation Alternative, farm deliveries would increase for the average, 10th percentile, and 90th percentile. The Irrigation Alternative would deliver 51,319 AF of water to farms on average. There would be no adverse economic impact to irrigators because this alternative would benefit farmers by delivering slightly more water to the farms as compared to the No Action Alternative.

FWR Alternative: For the FWR Alternative, decreased farm deliveries would be realized for the average and the 90th percentile deliveries. When comparing the FWR Alternative to the No Action Alternative, an average of 45,446 AF of water would be delivered to the farms. This would result in an adverse impact to farmers because of the decreased water supply. The lost benefits were determined by multiplying 45,446 AF by $18.91 per AF to get $859,000. To determine the average of economic benefits lost, subtract $859,000 from $930,000 to get $71,000. The annual lost benefits for the average deliveries and 90th percentile deliveries would come to $71,000 and $169,000, respectively.

The present worth of the annual lost benefits was calculated by assuming a 40-year time horizon (based on the length of contract). The interest rate used in an NED benefits study is the Federal discount rate, currently 5.125 percent. The net present worth of the lost benefits for the Fish, Wildlife, and Recreation Alternative, on the average would be $1,198,000. The net present worth of lost benefits for this Alternative under the 90th percentile would be $2,851,000.

Resources Largely Unaffected by Contract Renewal/Conversion

Merritt Reservoir Fishery—Merritt Reservoir is one of the best all around fisheries in Nebraska (Nebraska Game and Parks Commission 2005). The warm water fishery resource in Merritt Reservoir can be categorized as sport fish, pan fish, and bait fish.

According to the Nebraska Game and Parks Commission (2005), sport fish species in Merritt Reservoir include walleye, muskellunge, northern pike, channel catfish, black bullhead, largemouth bass, smallmouth bass, and white bass. The Snake River and its tributaries support black bullheads, rainbow trout, brown trout, rock bass, largemouth bass, and grass pickerel. The sport fishery below Merritt Dam consists primarily of rainbow and brown trout.

Most of the anglers at Merritt Reservoir fish for walleye, and the reservoir continue to be one of the top walleye fisheries in Nebraska. Creel surveys since 1991 show that, on the average, about 50 percent of the fishing pressure is directed at walleye (Nebraska Game and Parks Commission 2005). The Commission's 2004 survey collected 28.5 walleye per net, which is about the average catch over the past 15 years (Figure 3).

The sizes collected showed good numbers of walleye available from 15 inches to 25 inches (Figure 3). Because preferred spawning habitat is limited in the reservoir, the walleye population is maintained through annual stockings. A rate of 25 to 50 fingerling walleye per acre appears to provide the best return (Nebraska Game and Parks Commission 2005).

Merritt Reservoir has long been known for producing large channel catfish. The heyday of catfishing at Merritt Reservoir occurred in the mid-to-late 1980s. An explanation for the decline of size and numbers is that the fish have been harvested instead of practicing catch and release. Net catches of catfish are low at the reservoir and might reflect a low population density. Figure 4 shows the downward trend of master angler catfish caught at the reservoir. Angler harvest is likely impacting the population structure. The catfish population is maintained through an annual stocking of about 14,000 of eight- to ten-inch fish (Nebraska Game and Parks Commission 2005).

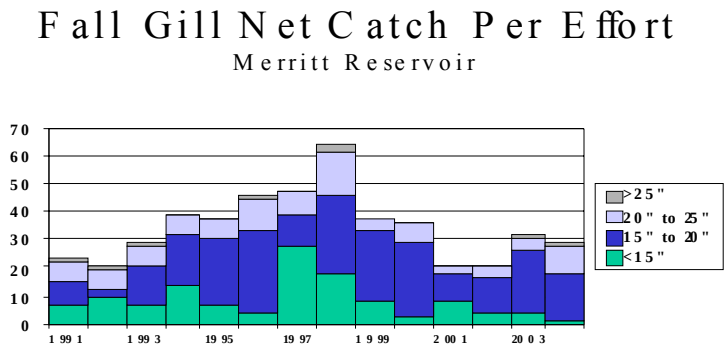


Figure 3. Walleye Fall Gill Net Catch Per Effort

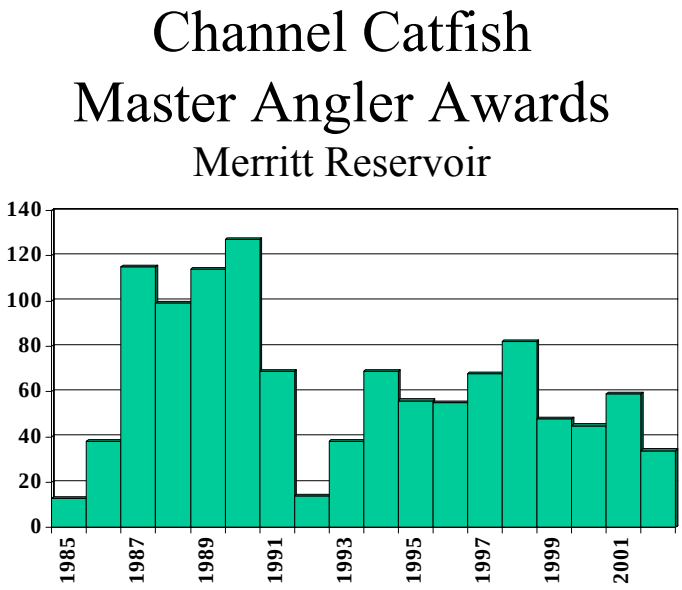


Figure 4. Channel Catfish Master Angler Awards

Merritt Reservoir is one of the few places in Nebraska that offers the opportunity to catch a muskellunge. "Musky" densities are believed to be low, with annual estimates of angler catch typically less than 100 fish. The population is maintained through the stocking of 1,000 twelve-inch fish in the spring. Prior to 1999, smaller six-inch fish were stocked in late summer. Research showed poor survival of these fish, resulting in the change to stock fewer, larger fish that survive better. Because the larger fish survive better, the Commission can stock fewer fish to maintain the population. Results of the sampling surveys indicate the change in the stocking program is working (Nebraska Game and Parks Commission 2005).

Northern Pike have been present in Merritt Reservoir for many years; however, prior to the mid-1990s, the numbers remained low. As the reservoir aged habitat changes favored pike and they have expanded in recent years (Nebraska Game and Parks Commission 2005).

Both largemouth and smallmouth bass are found in Merritt Reservoir. Based on extensive sampling in the mid-1990s and again in 2005, largemouth numbers are considered low, but the size structure shows good numbers of large fish. Smallmouth numbers are also low and most of the fish are small.

Pan fish species in Merritt Reservoir include yellow perch, bluegill, pumpkinseed sunfish, rock bass, and black crappie (Nebraska Game and Parks Commission 2005). The Snake River and its tributaries above and below Merritt Reservoir support green sunfish, pumpkinseed sunfish, and bluegill (Nebraska Game and Parks Commission 2005). Pumpkinseed and green sunfish are also present in the lower Snake River (Nebraska Game and Parks Commission 2005).

Black crappie, bluegill, yellow perch, and white bass are all important pan fish species in Merritt Reservoir. Black crappie produces consistent year-to-year action during the summer as well as through the ice. Bluegill and yellow perch produce good numbers in August and September. White bass have made a slight comeback in recent years boosted by stockings in 1995, 1998, and 2002. While still not significant when compared to the other pan fish harvests, it is hoped the white bass will reproduce and provide more of the white bass fishing Merritt Reservoir was known for in the late 1970s and 1980s. The low catch rate in 2003 shown in Figure 5 was likely a result of the ongoing drought in the region that resulted in severe draw-downs for several years (Nebraska Game and Parks Commission 2005).

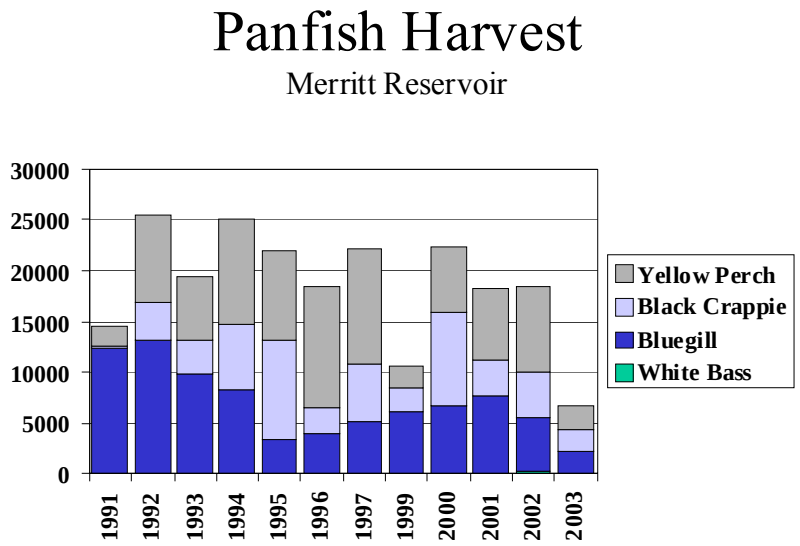


Figure 5. Pan fish Harvest at Merritt Reservoir

The predominant prey fish species in Merritt Reservoir include alewife and golden shiner. The prey species present in the Snake River and its tributaries above and below Merritt Reservoir include the golden shiner, emerald shiner, red shiner, river shiner, big-mouth shiner, sand shiner, plains topminnow, western silvery minnow, brassy minnow, longnose dace, and creek chub (Nebraska Department of

Environmental Quality 1992). The white sucker and longnose dace comprise the prey species of the lower Snake River (Nebraska Department of Environmental Quality 1992).

The end-of-month reservoir elevations were established by calculating releases to the Ainsworth Canal, on-farm deliveries, and releases to the Snake River. The average is defined as the arithmetic average for the period of record; the 10th percentile means that 90 percent of the time an elevation would be higher than the average; and the 90th percentile means that 10 percent of the time an elevation would be higher than the average. For the purposes of this analysis, the average elevation and surface areas were emphasized.

Environmental Consequences: Merritt Reservoir Fishery—A comparison of reservoir elevations for each alternative is shown on Table 6. The table shows end-of-month elevations for the average, 10th percentile, and 90th percentile. Table 7 shows the changes in reservoir elevations for the Irrigation and FWR Alternatives as compared to the No Action Alternative.

	Average			10th Percentile			90th Percentile		
	No Action	Irrigation	FWR	No Action	Irrigation	FWR	No Action	Irrigation	FWR
Jan	2944.0	2944.0	2944.0	2944.0	2944.0	2944.0	2944.0	2944.0	2944.0
Feb	2944.0	2944.0	2944.0	2944.0	2944.0	2944.0	2944.0	2944.0	2944.0
Mar	2945.0	2945.0	2945.0	2945.0	2945.0	2945.0	2945.0	2945.0	2945.0
Apr	2946.3	2946.3	2946.3	2946.3	2945.5	2945.5	2946.8	2946.8	2946.8
May	2946.0	2946.0	2946.0	2946.0	2946.0	2946.0	2946.0	2946.0	2946.0
June	2945.8	2945.8	2945.8	2945.8	2945.4	2945.5	2946.0	2946.0	2946.0
July	2938.3	2938.2	2938.1	2938.2	2935.3	2934.4	2943.3	2943.3	2943.3
Aug	2929.6	2928.6	2932.1	2928.6	2920.9	2929.0	2936.7	2936.1	2936.5
Sept	2932.1	2931.2	2934.1	2931.2	2923.9	2931.2	2936.3	2935.8	2936.3
Oct	2938.2	2937.7	2939.6	2937.7	2932.1	2937.9	2940.8	2940.6	2940.8
Nov	2943.1	2942.8	2943.9	2942.8	2938.6	2943.7	2944.0	2944.0	2944.0
Dec	2944.0	2943.0	2944.0	2943.0	2944.0	2944.0	2944.0	2944.0	2944.0

Table 6. Merritt Reservoir End of Month Reservoir Elevations

A comparison of surface area by alternative is shown on Table 8. It shows the available water surface areas associated with the end-of-month elevations for the average, 10th percentile, and 90th percentile for each alternative. The change in surface acres as compared to the No Action Alternative is shown on Table 9 for the Irrigation and FWR Alternatives.

No Action: Historically, there is an average of 1,429 surface acres at reservoir elevation 2929.6 at the end of August. Merritt Reservoir has been able to sustain catchable numbers of sport and pan fish under historic conditions. The annual reservoir fluctuation has had an effect on species abundance which the Commission maintains through their stocking program (Nebraska Game and Parks Commission 2005). It is assumed that the Commission will continue their annual stocking program at Merritt Reservoir. There would be no change in the current and future operations of Merritt Reservoir. The AID would continue to make voluntary 50 cfs releases from the reservoir to the Snake River.

	Average			10th Percentile			90th Percentile		
	No Action Elevation	Irrigation Feet	FWR Feet	No Action Elevation	Irrigation Feet	FWR Feet	No Action Elevation	Irrigation Feet	FWR Feet
Jan	2944.0	0.0	0.0	2944.0	0.0	0.0	2944.0	0.0	0.0
Feb	2944.0	0.0	0.0	2944.0	0.0	0.0	2944.0	0.0	0.0
Mar	2945.0	0.0	0.0	2945.0	0.0	0.0	2945.0	0.0	0.0
Apr	2946.3	0.0	0.0	2945.5	0.0	0.0	2946.8	0.0	0.0
May	2946.0	0.0	0.0	2946.0	0.0	0.0	2946.0	0.0	0.0
June	2945.8	0.0	0.0	2945.5	-0.1	0.0	2946.0	0.0	0.0
July	2938.3	0.1	-0.2	2934.5	-0.8	-0.1	2943.3	0.0	0.0
Aug	2929.6	-1.0	+2.5	2922.7	-1.8	+6.3	2936.7	-0.6	-0.2
Sept	2932.1	-0.9	+2.0	2925.7	-1.8	+5.5	2936.3	-0.5	0.0
Oct	2938.2	-1.4	+1.4	2933.4	-1.3	+4.5	2940.8	-0.2	0.0
Nov	2943.1	-0.3	+.08	2939.6	-1.0	+4.1	2944.0	0.0	0.0
Dec	2944.0	0.0	0.0	2944.0	0.0	0.0	2944.0	0.0	0.0

Table 7. Change in Merritt Reservoir Elevations Compared to the No Action Alternative

	Average			10th Percentile			90th Percentile		
	No Action Acres	Irrigation Acres	FWR Acres	No Action Acres	Irrigation Acres	FWR Acres	No Action Acres	Irrigation Acres	FWR Acres
Jan	2,692	2,692	2,692	2,692	2,692	2,692	2,692	2,692	2,692
Feb	2,692	2,692	2,692	2,692	2,692	2,692	2,692	2,692	2,692
Mar	2,826	2,826	2,826	2,826	2,826	2,826	2,826	2,826	2,826
Apr	2,933	2,933	2,933	2,867	2,867	2,867	2,975	2,975	2,975
May	2,909	2,909	2,909	2,909	2,909	2,909	2,909	2,909	2,909
June	2,892	2,892	2,892	2,867	2,859	2,867	2,909	2,909	2,909
July	2,044	2,038	2,031	1,798	1,850	1,791	2,611	2,598	2,598
Aug	1,477	1,429	1,633	1,153	1,086	1,450	1,941	1,903	1,928
Sept	1,633	1,577	1,772	1,281	1,200	1,577	1,951	1,883	1,915
Oct	2,038	2,006	2,129	1,723	1,633	2,018	2,262	2,235	2,262
Nov	2,571	2,531	2,678	2,129	2,064	2,651	2,692	2,692	2,692
Dec	2,692	2,678	2,692	2,692	2,692	2,692	2,692	2,692	2,692

Table 8. Merritt Reservoir Water Surface Acres by Alternative

Irrigation Alternative: Under this alternative, the AID would draw the reservoir down to elevation 2928.6 feet at the end of August (average condition). At this elevation there would be an average of 1,428 surface acres, or a four percent reduction when compared to the No Action Alternative. The lower storage elevation would result in a loss of shoreline habitat during the summer and early fall which could have a negative impact on fish rearing and survival. The decrease in the amount of littoral zone would result in less habitat and available forage for young fish during the summer and early fall and would

increase their vulnerability to adult fish. This reduction in the amount of aquatic habitat could stress the reservoir fish population competing for food and space.

	Average			10th Percentile			90th Percentile		
	No Action Acres	Irrigation Acres	FWR Acres	No Action Acres	Irrigation Acres	FWR Acres	No Action Acres	Irrigation Acres	FWR Acres
Jan	2,692	0	0	2,692	0	0	2,692	0	0
Feb	2,692	0	0	2,692	0	0	2,692	0	0
Mar	2,826	0	0	2,826	0	0	2,826	0	0
Apr	2,933	0	0	2,867	0	0	2,975	0	0
May	2,909	0	0	2,909	0	0	2,909	0	0
June	2,892	0	0	2,867	-8	0	2,909	0	0
July	2,044	-6	-13	1,798	+52	-7	2,611	-13	-13
Aug	1,477	-48	+156	1,153	-67	+297	1,941	-38	-13
Sept	1,633	-56	+139	1,281	-81	+296	1,951	-68	-36
Oct	2,038	-32	+91	1,723	-90	+295	2,262	-27	0
Nov	2,571	-40	+107	2,129	-65	+522	2,692	0	0
Dec	2692	-14	0	2,692	0	0	2,692	0	0

Table 9. Change in Merritt Reservoir Surface Acres Compared to the No Action Alternative

Other potential impacts associated with the slight reduction in the aquatic habitat availability could result from overcrowding, lower dissolved oxygen, higher water temperatures, increased turbidity, and competition for the remaining food source.

This analysis assumes the Commission would continue their netting surveys and maintain the walleye, white bass, channel catfish, yellow perch, and muskellunge populations through their fish stocking program.

The AID would not make specific releases from Merritt Reservoir to the Snake River for fisheries benefits under this alternative. The seepage from Merritt Dam and stream gains downstream would continue. Daily changes in releases to the river would be made in no more than 50 cfs increments to minimize adverse impacts on the Snake River fishery downstream of the dam.

FWR Alternative: Under this alternative, a minimum reservoir pool elevation of 2929.0 feet at Merritt Reservoir would be established and maintained. There would be an average of 1,633 surface acres at reservoir elevation 2932.1 feet at the end of August, or a ten percent increase in the surface area when compared to the No Action Alternative.

The AID would release storage water to the Ainsworth Canal for delivery to project irrigators; however, when the reservoir reached elevation 2929.0 feet, releases of natural flows into the canal would be regulated to maintain the minimum pool. Aquatic conditions in Merritt Reservoir would be improved compared to those described in the No Action Alternative because of overall higher reservoir elevations and an increase of littoral zone habitat.

This analysis assumed the Commission would continue their netting surveys and maintain the walleye, white bass, channel catfish, yellow perch, and muskellunge populations through their fish stocking program. In addition, the AID would provide water releases from the reservoir to the Snake River below the dam based on recommendations from the Commission to regulate water temperature and dissolved oxygen levels to benefit brown and rainbow trout, water quality, and overall aquatic health and life in the river. If necessary, the minimum pool elevation would be adjusted in response to these releases. Daily changes in releases to the river would be made in no more than 50 cfs increments to minimize adverse impacts on the Snake River fishery downstream of the dam.

Lower Snake River Fishery— Fish in the Snake River occupy specific habitat niches within the confines of the river. These include (but are not limited to) deeper pools with slower flowing water and submerged gravel bars with faster flowing water. The Commission has conducted fish surveys in the Snake River below Merritt Dam. The Commission's survey results are presented in Appendix B.

The Snake River has been identified as the best trout stream in Cherry County and is one of the best in Nebraska (Reclamation 1995). Specific spawning times for rainbow and brown trout in the Snake River below Merritt Dam have not been determined. However, rainbow trout typically spawn in late winter to early spring (March would be a typical month). There is evidence of brown trout spawning in other Sandhill streams in late October and early November (J. Klammer, personnel communication 2006).

The Commission initiated in-stream flow studies under the direction of Phil Hilgert in the 1970's and the studies continued under the direction of Larry Hutchinson in the 1980s. These studies were designed to quantify optimal flows for the enhancement of fishery values in the lower Snake River. At this time the Commission has not developed specific instream flow recommendations for the Snake River below Merritt Dam.

Flows from the Snake River and Boardman Creek are stored in Merritt Reservoir. The reservoir is filled each fall after the irrigation season to elevation 2944.0 feet (approximately two feet below the top of conservation pool). The reservoir is regulated to maintain this level until the ice clears each spring. This filling process generally takes place in April and is maintained until irrigation releases begin around mid-May. When possible, a minimum release of 75 cfs is made to the river during spring filling operations to enhance the rainbow trout fish spawn. Seepage, stream pickup and toe drain flow normally result in flows of up to 15 cfs below Merritt Dam. Daily changes in releases to the river are made in no more than 50 cfs increments to minimize adverse impacts on the Snake River trout fishery downstream of the dam. Figure 6 illustrates the average monthly flow for each alternative in the Snake River below Merritt Dam.

In 1986, Reclamation constructed six weir measuring devices on the Snake River below Merritt Dam. An environmental assessment was prepared, with one of the mitigating measures implemented to offset potential impacts in the Snake River was the improvement of trout habitat. The contractor was required to furnish 25 cubic yards of granite rock boulders from 15-24 inches in size, with each rock weighting between 200-225 pounds. Placement and configuration of boulders to benefit the existing trout resource in the affected stretch of the Snake River was determined by the U.S. Fish and Wildlife Service (FWS), Commission, and Reclamation personnel. Although survey data are limited, some increase in trout numbers have been noted in recent years (Table 10).

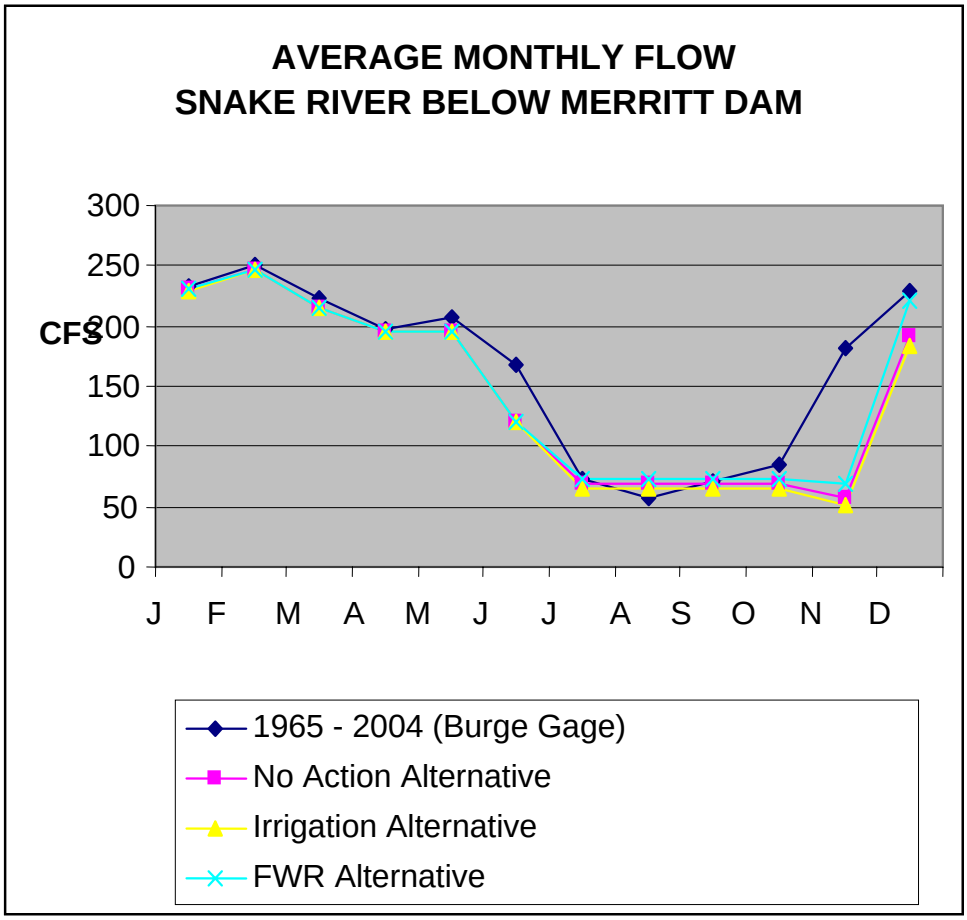


Figure 6. Average monthly flow in the Snake River below Merritt Dam

In the 1995 Appraisal Study Report, Reclamation recommended that the dam should be operated to provide a minimum release of 75 cfs during trout spawning season (rainbow trout in March, April, and May; brown trout in September and October) and daily changes in river releases should be held to incremental changes of 50 cfs whenever possible to minimize impacts to the fishery. An instream flow of 50 cfs should be maintained during June through August for temperature augmentation. It is impossible to make smaller releases over a longer period of time because small gate openings cause serious cavitation on the sills of the regulating gate.

As outlined in Reclamation's Annual Operating Plan (AOP): "A minimum release of 75 cubic feet per second (cfs) should be made to the river during spring filling operations if at all possible. This operation enhances the spring fish spawn in the Snake River below Merritt Dam. Seepage, pickup, and toe drain flow normally result in flows of up to 15 cfs below Merritt Dam. Whenever possible, daily changes in releases to the river should be made in no more than 50 cfs increments to minimize adverse impacts on the Snake River fishery downstream of the dam."

Record Number	Survey Date	Rainbow Trout	Brown Trout
4548	06-28-39	0	0
4287	09-07-73	0	0
4288	09-07-73	0	8
922	08-18-82	3	1
923	07-21-88	0	71
924	05-18-89	6	0
925	07-25-89	0	6
926	10-10-89	1	3
4932	10-04-97	90	156
4933	10-04-97	11	0

[1] Schainost 2006.

Table 10. Rainbow and brown trout survey data collected from various sites on the Snake river below Merritt Dam, 1939-1997[1]

The issue of fish kills on the Snake River below Merritt Dam was identified as a concern during the NEPA scoping process. The Nebraska Department of Environmental Quality (DEQ) is required to record and document reported fish kills. However, in both 1981 and 2000, the fish kill reports were somewhat vague and there was no actual species count or water sampled during the investigations (Lund 2003). On July 1, 1980, a fish kill was recorded for brown trout on the Snake River below Merritt Reservoir. The official cause was listed as unknown (Nebraska Department of Environmental Quality 2003). On June 14, 2000, a fish kill was recorded for white suckers and trout on the Snake River below Merritt Reservoir. The official cause was listed as low oxygen and high temperatures due to low flows (Nebraska Department of Environmental Quality 2003).

Original speculation as to the cause of the June 14, 2000, fish kill centered on reservoir releases coupled with a cattle drive across the river at the water gap. However, after checking the dates of the cattle crossing and finding dead trout above the water gap used for the crossing, this theory was discounted (J. Klammer, personal communication 2000). The exact cause of the fish kill was not determined.

The temperature tolerance range for rainbow trout is 6-23 degrees Celsius and 0-27 degrees Celsius for brown trout (Cherry et al. 1977 and Brungs and Jones 1977). Optimal temperature for both species is around 12 degrees Celsius (Cherry et al. 1977 and Brungs and Jones 1977). Stress associated with warm water releases from the reservoir and the threat of fish kills has resulted in questioning the benefit of "optimal" summer releases from Merritt Dam into the Snake River when the trout are showing signs of physical stress.

Releasing water during summer months can stabilize or increase the amount of wetable habitat. However, warm water releases from the reservoir into the river water which is already warm from daytime temperatures can result in the water not cooling off as fast during the evening and night time. In July of 2003, Environmental Research Institute (ERI) placed temperature probes in four locations on the Snake River below Merritt Dam (Figure 7). The probes were stationed between two and four feet below the water surface and recorded hourly temperature from July 23-October 27, 2003. The purpose of the probes was to acquire a baseline data set of Snake River temperatures and to monitor any temperature changes if the AID was asked to terminate releases from the reservoir. At the request of local fishing

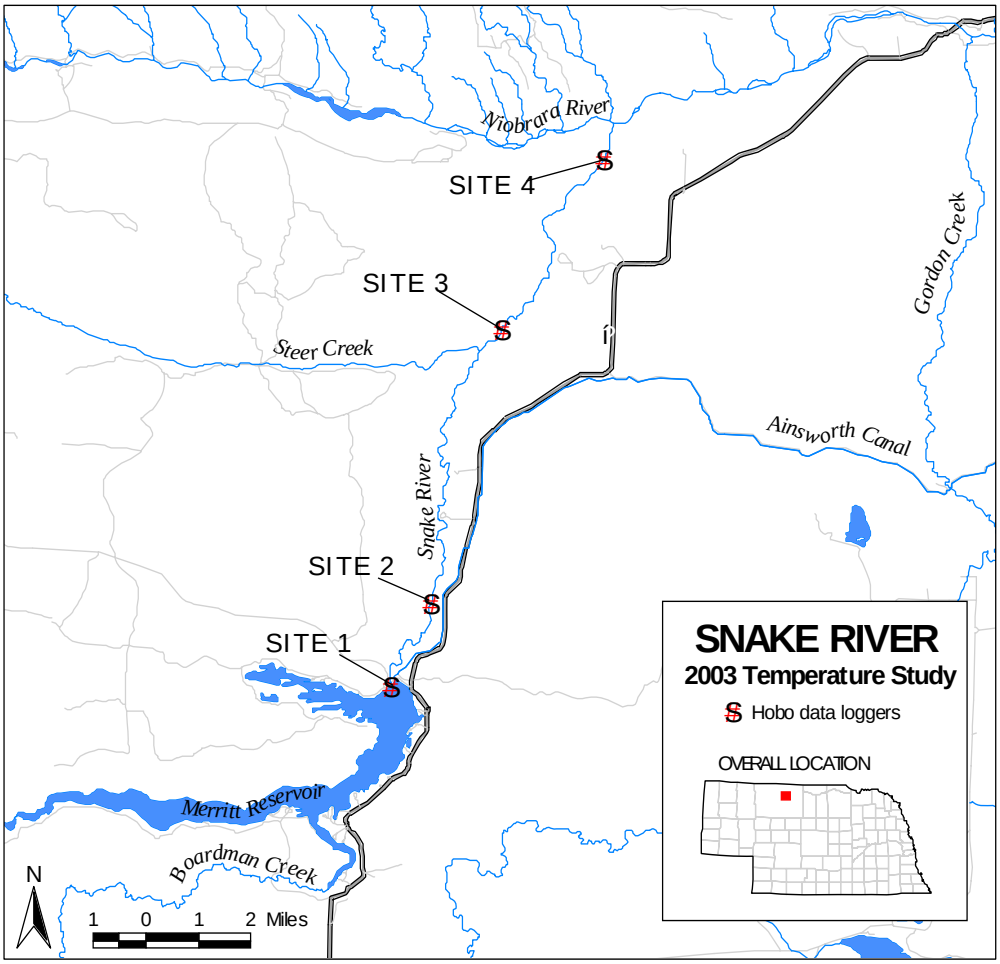


Figure 7. Location of Hobo temperature probes installed in the Snake River below Merritt Dam during 2003 (Ecosystem Research Institute 2003).

interests, the AID discontinued flows from Merritt Dam into the Snake River on August 25, 2003. Average changes in water temperature were then recorded (Table 11).

From May 1-September 30, 2004, Joel Klammer (Fisheries Biologist, Nebraska Game and Parks Commission) deployed four thermographs and recorded hourly temperatures, in the Snake River below Merritt Reservoir. There is a large quantity of information contained in these data sets, but in general water temperatures in late summer hover near the upper thermal range for trout. However, the magnitude and duration of these temperatures appears not to have exceeded any critical thermal threshold for this population as evidence by the quality of the fishery in 2005. It is quite possible that the trout population in the Snake River has adapted to a slightly higher thermal regime than normal, particularly if the 2004 temperature data are reflective of the general condition since dam construction. (Nankervis 2005).

	Site 1	Site 2	Site 3	Site 4
With Merritt Dam Releases	23.4	22.11	21.17	21.76
Without Merritt Dam Releases	12.65	13.86	14.09	14.53

[1] Nankervis 2000.

Table 11. Average water temperatures (C) for sites in the Snake River below Merritt Dam between July 23-October 27, 2003[1]

Environmental Consequences: Lower Snake River Fishery—The issues addressed in this section deal with the Snake River fishery below Merritt Dam and how proposed changes in operation of Merritt Reservoir would affect this resource. Although several species use the Snake River below Merritt dam (Appendix B), trout are of particular interest. Fish kills involving trout have occurred in the past, but the cause of these events has not always been clear. Water temperatures above the upper end of trout's thermal tolerance range may have played a role. Because releases from Merritt Reservoir would be similar to No Action conditions for both the irrigation and FWR Alternatives during summer months when fish kills have occurred (Figure 6), future conditions under either of these alternatives would likely be very similar to No Action conditions.

No Action Alternative: There would be no change in the current and future operation of Merritt Reservoir under this alternative. When available, the AID would continue to make voluntary 75 cfs releases to the Snake River below Merritt Dam. The stream seepage, pickup and toe drain flow would continue in the Snake River. The proposed contract renewal or conversion of the AID's long-term water service contract would not have an adverse effect on the existing fisheries in the Snake River below Merritt Dam.

Irrigation Alternative: The aquatic conditions in the Snake River below Merritt Dam would be similar to those described under the No Action Alternative. The proposed contract renewal or conversion of the AID's long-term water service contract would not have an adverse effect on the existing fisheries in the Snake River below Merritt Dam.

FWR Alternative: At the request of the Commission, the AID would provide water releases from Merritt Reservoir to the Snake River to maintain conditions to benefit brown and rainbow trout, water quality, wildlife, and overall aquatic life in the river. There releases could vary in amount: the minimum pool elevation would be adjusted in response to these releases. The stream seepage, pickup, and toe drain flow would not change. The proposed contract renewal or conversion of the AID's long-term water

service contract would not have an adverse effect on the existing fisheries in the Snake River below Merritt Dam.

Water Quality

Surface Water Quality—During May, July, and September 2001, eight representative locations within the AID (Bone Creek and Sand Draw sub-watersheds) were identified and sampled for trace elements, nutrients, and pesticides. Most constituents were sampled below detection or within Federal and State chronic and acute criteria for aquatic life. The concentration of metallic aluminum was found at concentrations exceeding aquatic life criteria.

Exceedence of aquatic criteria for aluminum occurred in Sand Draw. Water samples were single grab samples collected in Sand Draw during May 2001. Results of the May sampling event at two locations in Sand Draw receiving irrigation return flow were 1163 and 1424 micrograms per liter, or parts per billion (ppb). Sample results of the July and September collection events in Sand Draw did not exceed aquatic life criteria for aluminum

Aluminum is one of the most abundant elements on earth. It occurs in many rocks and ores but never as a pure element in nature. Although the metal itself is insoluble, many of its salts are readily soluble. Other aluminum salts, however, are quite insoluble and not likely to occur over long periods of time in surface waters because it precipitates and settles or is absorbed as aluminum hydroxide, aluminum carbonates, and various other compounds.

The chemistry of aluminum in surface water is complex. Ambient water quality criteria for aluminum addresses the toxicity of aluminum to freshwater organisms in waters in which the pH is between 6.5-9.0. All waters sampled at the AID had a pH range of 6.2-8.4. The ambient freshwater Final Acute Value for aluminum is calculated to be 1,496 ppb. The Final Chronic Value for aluminum is equal to the Criterion Maximum Concentration of 748 ppb for fresh water.

The procedures described in the "Guidelines for Deriving Numerical National Water Quality Criteria for the Protection of Aquatic Organisms and Their Uses" indicate that, except possibly where a locally important species is very sensitive, freshwater aquatic organisms and their uses should not be significantly impacted, when the pH is between 6.5-9.0, provided the four-day average concentration of aluminum does not exceed 87 ppb more than once every three years on the average, and if the one-hour average concentration does not exceed 750 ppb more than once every three years on the average.

While the 2001 sampling events were not designed to address one-hour average concentrations, it can be assumed that since all AID sample results for aluminum were below ambient freshwater acute values, and exceeded final chronic values on only two occurrences during a single sampling event (May 2001) freshwater aquatic organisms should not be unacceptably affected (U.S. Environmental Protection Agency 1985).

Project Area Watersheds and Surface Water Resource—Long Pine Creek is in north central Nebraska on the northeastern edge of the Nebraska Sandhills and is the longest self-sustaining trout stream in the state. Sand Draw and Bone Creek cross and merge north of the AID and flow northeast to the confluence with Long Pine Creek. The issue of Sand Draw and Bone Creek erosion was identified as a concern during the NEPA public scoping meetings and the technical scoping meetings with various Federal and State agencies.

Prior to the construction of the Unit, Sand Draw was intermittently-flowing and Bone Creek was perennially-flowing, with the exception of its upper two-three miles. Because hydrologic conditions

within the watershed have changed over the years due to higher groundwater elevations and increased surface flows, Sand Draw and Bone Creeks are now perennially-flowing and are experiencing significant head cutting and degradation.

Reclamation's 1954 planning estimates predicted combined flows of 13,000 AF per year for Sand Draw and Bone Creeks. Reclamation has since estimated the combined flows at approximately 40,000-50,000 AF per year using figures from the upper and lower gauging stations on Long Pine Creek (Reclamation 1995). Vertical head cutting ranging from 10-15 feet exists in some stretches along Sand Draw.

In 1981, the Long Pine Creek watershed was one of 21 watersheds in the United States selected for the experimental Rural Clean Water Program (RCWP). The RCWP was a Federally-sponsored program designed to control agricultural non-point source (NPS) pollution in rural watersheds with the goal of improving water quality.

With the selection of the Long Pine Creek Watershed for the RCWP, a local coordinating committee consisting of members of 15 agencies and local groups applied for the project. Reclamation was not a member of the coordinating committee. The program provided a total of $1.3 million in cost-share funds to implement 15 best management practices (BMPs) designed to control NPS pollution within the Long Pine Creek watershed.

Sediment, bacteria, and nutrients are the primary surface water pollutants impairing recreation and fishing on Long Pine Creek. Sand Draw and Bone Creek deliver excessive sediment load, warmer water, high fecal coliform, and fluctuating flow to lower Long Pine Creek. Excessive erosion occurs in the headwaters of Long Pine Creek due to intensive grazing in riparian areas, erosion of unprotected stream banks and adjacent gullies, cropland and rangeland runoff, livestock operations, irrigation wasteway discharges and return flows. In addition, the town of Ainsworth's sewage treatment plant contributes to high bacterial and nutrient loading in these tributaries (Long Pine RCWP 1991).

The Long Pine Creek Rural Clean Water Program Ten Year Report 1981-1991 (Long Pine RCWP 1991) discussed possible remediation measures that could be implemented within the watershed. The report suggested that besides grade stabilization structures, BMPs for the entire basin should be considered and implemented. These measures included such items as livestock fencing and controlled grazing, livestock wells with windmills for watering, bank stabilization, etc.

The AID has operated the project for almost 40 years. During this time, a few erosion control measures and BMPs have been constructed or implemented in the watershed. Those measures were constructed and funded by the RCWP, county, and/or AID without Reclamation's cost sharing participation.

Reclamation has researched the Nebraska DEQ's Clean Water Act 303(d) data base list of Water Bodies, Impairments, Parameter of Concern and Pollutant Source, and neither Bone Creek nor Sand Draw stream segments are listed. However, three segments (33.9 miles) of Long Pine Creek upstream of the project area (AID) are listed with dissolved oxygen and temperature being the parameters of concern with the designated pollutant source being "non-point source".

The proposed Federal action in the DEA is to renew or convert the AID's long-term water service contract. The AID has stated there will be no change in the future operation of the AID. Therefore, the DEA analyzes those environmental affects associated with contract renewal or conversion assuming that future operations would remain similar to current operations.

The immediate issue of responsibility for Total Maximum Daily Load (TMDL) mitigation between all potentially responsible and interested parties (AID, Reclamation, DEQ, EPA), whether contract renewal

or conversion occurs, is not a Clean Water Act regulatory requirement issue since Bone Creek and Sand Draw are not listed as impaired water bodies.

Environmental Consequences: Water Quality

No Action Alternative—The presence of aluminum would not be increased in surface water quality by the renewal or conversion of the AID's long-term water service contract, regardless of which alternative is selected when compared to the No Action Alternative. Likewise, renewal or conversion (which would include continued delivery of project water) would not affect project area watersheds and surface water resources. Existing erosion patterns in Long Pine, bone Creek, and Sand Draw watersheds would continue. Erosion rates have long since stabilized during the life of the AID. It is not anticipated an acceleration of existing erosion patterns would occur since land areas, cropping patterns, irrigation practices and efficiencies, water delivery, and irrigation return flow velocities and volumes would remain constant.

Irrigation Alternative—This alternative would not affect surface water quality or project area watersheds and surface water resources as explained under the No Action Alternative.

FWR Alternative—The FWR Alternative would not affect surface water quality or project area watersheds and surface water resources as explained under the No Action Alternative.

Wildlife and Habitat —The Ainsworth Unit is located in the Nebraska Sandhills eco-region, which covers an area of about 38,000 square miles (U.S. Environmental Protection Agency 2006). The Sandhills, characterized by dune topography, is one of the largest continuous expanses of native grassland left in North America. They contain a distinct grassland association dominated by sand bluestem and needle-and-thread grasses (U.S. Forest Service 2006). The Sandhills grasslands consist primarily of native warm season grasses and flowering forbs.

The Commission manages 5,797 acres of wildlife land and wildlife resources at Merritt Reservoir. Various habitat types and approximate acreages are listed in Attachments 2 and 3 at the end of this report. Approximately 290,000 tree and shrub species have been planted around the reservoir over the years to control wind erosion, provide wildlife with food and cover, and enhance recreational camping sites.

Mammals commonly found at Merritt Reservoir and throughout the Unit include, but are not limited to, the deer mouse, white-footed mouse, meadow vole, pocket gopher, raccoon, eastern cottontail rabbit, stripped skunk, Franklin's ground squirrel, porcupine, coyote, and bobcat. Big game present in the area includes mule deer, white-tailed deer, and antelope.

Birds frequently found at the reservoir and within the Unit include, but are not limited to, eastern and western meadowlark, mourning dove, belted kingfisher, marsh hawk, prairie falcon, mallard, great blue heron, and black-billed magpie. Game birds found within the area include ring-necked pheasant, sharp tailed grouse, greater prairie chicken, and turkey.

Amphibians and reptiles common to the reservoir and Unit include, but are not limited to, bullfrog, six-lined racerunner, plains garter snake, common snapping turtle, and western painted turtle.

It is likely the abundance and species composition of upland birds around Merritt Reservoir changed as a direct result of human-introduced habitat changes due to the construction of the reservoir and land use management changes implemented by the Commission. Species that favor open water reservoir habitat, native grassland intermixed with shelterbelts, and riparian habitat at the reservoir and along the Snake

River above and below Merritt Reservoir have flourished, while those species favoring large expanses of undisturbed native grass prairie probably decreased.

The AID provides water to irrigate 34,539 acres. As grassland was converted to cropland within the AID, species diversity was altered. Wildlife species associated with minimally-disturbed grasslands were replaced with species more commonly associated with croplands.

Environmental Consequences: Wildlife and Habitat

No Action Alternative: All three alternatives assume: (1) the lease agreement between Reclamation and Commission for the management of lands and water at Merritt Reservoir would remain in effect; (2) the Commission would continue to manage the wildlife lands and resources at Merritt Reservoir; (3) land use, cropping patterns, and the amount of irrigable land would not increase and (4) the quality of water diverted for irrigation would not change. Regardless of which alternative is selected, no significant changes or adverse impacts to habitat and/or wildlife resources would result when compared to the No Action Alternative.

Irrigation Alternative: This alternative would not affect wildlife or habitat as explained under the No Action Alternative.

FWR Alternative: This alternative would not affect wildlife or habitat as explained under the No Action Alternative. Waterfowl and birds which use open water habitat at Merritt Reservoir would benefit as a result from the establishment of a minimum pool.

Migratory Birds —Executive Order 13186 requires Federal agencies to consider the effects of their programs, policies, and activities on migratory birds. The Snake and Niobrara Rivers lie within the Central Flyway and provide important migration habitat for migrating waterfowl, shorebirds, wading birds, and neotropical migratory birds.

Migratory water birds passing through the area use natural wetlands for forage and loafing habitat, waste grain from agricultural areas for high quality foods, and reservoirs like Merritt Reservoir for sanctuary, foraging, and loafing habitat. The Niobrara River provides important habitat for sandhill and whooping cranes, least terns, piping plovers, and many other species of shorebirds and waterfowl. Common water birds that migrate through the Central Flyway include, but are not limited to, mallards, teal, shovelers, scaup, coots, Canada geese, herons, egrets, sandpipers, gulls, plovers, terns, sandhill and whooping cranes, and cormorants. Depending on climatic conditions and availability of open water, some of the migratory waterfowl may stay into the winter months.

Neotropical migratory birds passing through or breeding in the watershed include but are not limited to eastern and western meadowlark, shallows, wrens, American robin, vireos, sparrows, blackbirds, flycatchers, finches, kingbirds, and warblers.

Riparian vegetation found at Merritt Reservoir and along the Snake River above and below Merritt Reservoir (Attachment 4) provides foraging, roosting, nesting, and brood-rearing habitat for migrating songbirds. Grassland habitats provide these same attributes for ground-nesting species.

Other migratory birds include, but are not limited to, eagles, hawks, osprey, owls, and falcons. Raptor species associated with the Basin include red-tailed and Swainson's hawks and barn, great-horned, and burrowing owls.

At the top of the conservation pool (elevation 2946.0 feet) there are 2,909 surface acres available at Merritt Reservoir. Under historic normal operations Merritt Reservoir begins to fill as soon as the irrigation season ends and reaches the over-wintering elevation of 2944.0 feet in mid-November. Table 8 shows the surface areas for the Irrigation and FWR Alternatives compared to the No Action Alternative.

Tables 6 and 7 show the end-of-month reservoir elevations and changes of reservoir elevations compared to the No Action Alterative. Table 9 list surface acres associated with the end-of-month elevations and changes in surface area for the Irrigation and FWR Alternatives as compared to the No Action Alternative.

Environmental Consequences: Migratory Birds—All three alternatives assume: (1) the lease agreement between Reclamation and Commission for the management of lands and water at Merritt Reservoir would remain in effect; (2) the Commission would continue to manage the wildlife lands and resources at Merritt Reservoir; (3) land use, cropping patterns, and the amount of irrigable land would not increase and (4) the quality of water diverted for irrigation would not change.

No Action Alternative: On average, there are 1,477 surface acres of water at reservoir elevation 2929.6 feet at the end August. This provides loafing and refuge habitat for early migrating birds. As the reservoir fills, the surface area increases providing additional open-water habitat for late-season migrants prior to the reservoir icing over. The No Action Alternative would not have any measurable adverse effect on neotropical and other migratory bird species.

Irrigation Alternative: There would be an average of 1,429 surface acres of water at reservoir elevation 2928.6 feet at the end of August resulting in reduction of 48 surface acres of water when compare to the No Action Alternative. This small reduction (three percent) would not adversely affect the availability of loafing and refuge habitat for early or late season migrants. At the 2928.6 foot elevation, Merritt Reservoir would reach the over-wintering elevation of 2944.0 feet in mid-November, similar to the No Action Alternative. The Irrigation Alternative would not have any measurable adverse effect on neotropical and other migratory bird species.

FWR Alternative: There would be an average of 1,633 surface acres of water at reservoir elevation 2932.1 at the end of August resulting in a gain of 156 surface acres of water when compared to the No Action Alternative. This slight increase in surface area of water of about 10 percent would provide migratory waterbirds with slightly more open-water habitat conditions than those described in the No Action Alternative. The FWR Alternative would not have any measurable adverse effect on neotropical and other migratory bird species.

Wetlands —In general terms, wetlands are lands that are transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is covered by shallow waters. The U.S. Fish and Wildlife Service conducted a wetlands inventory of Cherry, Brown, and Rock counties. Specific wetland information is available through the FWS's National Wetlands Inventory (NWI) web site. Wetlands data have been extrapolated for Merritt Reservoir and irrigable lands within the AID boundary.

Based on the NWI, there are three classes of wetlands associated with Merritt Reservoir including lacustrine, palustrine, and riverine wetlands as defined by Cowardin, et. al. (1979). These delineated wetlands are identified on Attachments 5 and 6.

Lacustrine wetlands include deepwater habitats that are situated in a dammed river channel with a total area that exceeds 20 acres in size. Much of Merritt Reservoir is classified as a lacustrine wetland. Riverine wetlands are contained within a defined channel. A channel is defined as an open conduit either naturally or artificially created which periodically or continuously contains moving water (Cowardin, et.al 1979). The Snake River above and below Merritt Reservoir is classified as riverine wetland. Palustrine wetlands include non-tidal wetlands covering areas less than 20 acres with water up to 6.6 feet deep. These wetlands have seasonal fluctuations in water level and are usually dominated by trees, shrubs, and persistent emergent (i.e. cattails, sedges, rushes, etc.). Traditionally, palustrine wetlands have been referred to as marshes, swamps, bogs and prairie wetlands. Wetlands in shallow water around the reservoir and isolated wetlands on land adjacent to the reservoir and the Snake River are classified as palustrine wetlands.

Based on FWS's data, the following wetland types and acreages are associated with Merritt Reservoir:

- Lacustrine—2,591.7 acres
- Palustrine— 157.9
- Riverine— 20.8

  Total 2,770.4 acres

Riverine and palustrine wetlands occur within the AID. The location of these wetlands is shown in Attachment 6. The NWI does not distinguish between wetlands occurring on project and those on non-project lands. Based on the FWS's data, the following the following wetlands occur within the AID project boundary:

- Palustrine— 298 acres
- Riverine— 21

  Total 319 acres

Environmental Consequences: Wetlands

No Action Alternative: Lacustrine wetlands at Merritt Reservoir are seasonally-affected by lower elevations in the summer due to annual irrigation releases under the current conditions and the No Action Alternative. However, dewatering is temporary because the reservoir is refilled to within elevation 2944.0 feet each fall. Similarly, under current conditions and the No Action Alternative, palustrine wetlands may be affected temporarily dewatered by fluctuating water levels within Merritt Reservoir during late summer. When the reservoir refills in the fall the adjacent groundwater mound rises to recharge these wetlands. Riverine wetlands and palustrine wetlands associated with the Snake River above and below Merritt Reservoir have adjusted to the current hydrologic regime and are not adversely affected by current conditions or the No Action Alternative. Wetlands that occur within the AID are supported by annual precipitation and seasonal irrigation that recharges the groundwater.

Wetlands that occur within the AID are affected by annual precipitation and seasonal irrigation. Regardless of the alternative selected, the proposed renewal or conversion of the long-term water service contract would not change or affect hydrologic conditions supporting wetlands at Merritt Reservoir, along the riparian area of the Snake River, or within the AID. In addition, renewal or conversion of the AID long-term water service contract would not necessitate alteration of the wetland basins within the AID.

Irrigation Alternative: This alternative would not affect wetlands as explained under the No Action Alternative.

FWR Alternative: This alternative would not affect wetlands as explained under No Action.

Riparian Vegetation—The banks of the Snake River above and below Merritt Reservoir are classified as riparian areas, and the plants that grow there are classified as riparian vegetation. Riparian vegetation is extremely important because of the many functions it serves, i.e. bank stabilization, water quality protection, fish habitat, wildlife habitat, etc. The Center for Advanced Land Management Information Technologies (CALMIT) in Lincoln, Nebraska, has identified riparian habitat that exists around the shoreline at Merritt Reservoir. The extent of the riparian vegetation within this area is depicted in Attachment 4.

Environmental Consequences: Riparian Vegetation

No Action Alternative: Riparian vegetation under the No Action Alternative, either around Merritt Reservoir or along the Snake River, would not be expected to change from current conditions. Neither of the other two alternatives would be expected to adversely affect riparian vegetation because any resultant changes in reservoir fluctuations would be similar to those already associated with the No Action Alternative; are of short duration (i.e. the lowest reservoir elevations are reached in late August and begins its fall-filling schedule on October 1st); and most riparian plants have adapted to the periods of variable wet and dry conditions.

Irrigation Alternative: This alternative would not affect riparian vegetation as explained under the No Action Alternative.

FWR Alternative: This alternative would not affect riparian vegetation as explained under No Action.

Recreation —Information for the recreation section is summarized from the "Detailed Methodology for Determining Recreation and Socioeconomic Benefits," Appendix C.

When full at elevation 2946 feet msl, Merritt Reservoir has a surface area of 2,933 acres and 44 miles of shoreline. Despite being an irrigation project, inflows from both the Snake River and Boardman Creek reduce the risk of excessive long-term drawdown. Given that the reservoir experiences moderate annual water level fluctuation, recreation opportunities are seldom limited by inadequate water levels during the summer recreation season. Recreation on and around the reservoir within Merritt Reservoir State Recreation Area is managed by the Commission. Available recreation facilities are shown on Attachment 7.

Recreation activities and facilities associated with Merritt Reservoir are:

- Fishing: The reservoir offers some of the best fishing in the State, especially for walleye. The fishing season in this multi-species warm water fishery is year-round and, in addition to walleye, other game fish species include muskie, largemouth bass, smallmouth bass, white bass, crappie, yellow perch, channel catfish, bluegill, bullheads, and northern pike. Many of these species grow to trophy size as evidenced by several State and world records. As a result, fishing is the most popular recreational activity at the reservoir.

- Boating: Motorized boating, waterskiing, and sailing are also popular activities during the summer months. There are 5 boat ramps at the reservoir at Beeds Landing Campground, Cedar Bay Campground, Main Lake Campground, Powderhorn Campground, and Snake River Campground. The ramps at Beed's Landing and Cedar Bay are two-lane while the others are one. There is also a marina at the reservoir. The Merritt Trading Post area has rental boats but no private marina slips.

- Camping: Merritt Reservoir provides for both developed RV camping and undeveloped tent camping. There are 11campgrounds located at Merritt Trading Post, Main Lake, Cedar Bay, Beeds Landing, Boardman Creek, Snake River, Powderhorn, Pines, Cottonwood, Lone Tree, and Willow Cove. The last four are primitive campgrounds (tent sites only), while the others are developed and allow RVs. Camping is the second most popular recreational activity at the reservoir.

- Picnicking: There area nine picnic areas, two hundred picnic tables, and eight picnic shelters at various locations around the reservoir.

- Swimming: Despite the lack of officially designated beaches, naturally occurring sugar sand beaches are exposed as the reservoir is drawn down during mid- to late-summer, providing swimming opportunities.

- Hunting: The Commission manages the area not only for recreation, but also for fish and wildlife purposes as well. Hunting for waterfowl, small game, and big game is allowed during specified season within Merritt Reservoir State Recreation Area. Hunting is more popular in the R. McKelvie National Forest located directly north of and adjacent to the reservoir.

- Hiking: Some hiking activity occurs within the Merritt Reservoir State Recreation Area, but much more occurs in the R. McKelvie National Forest.

- Sightseeing: Given the scenic nature of the reservoir, some people visit primarily for sightseeing purposes.

Reservoir Recreation Visitation and Value: Table REC 1 in Appendix C presents information on total visitation by year from 1995-2004. Across the ten-year period, total annual visitation per year averaged 133,500 visits. Recent data on visitation by recreation activity does not exist; however such data are available for 1989-1994. Using the percentages of visitation by recreation activity from 1989-1994 applied to the 1995-2004 annual visitation average indicates that fishing and camping are the dominate activities comprising over 80 percent of the total. The top four activities—fishing, camping, boating (including waterskiing), and picnicking—account for over 96 percent of total visitation.

In addition to the visitation information, Table REC 1 also presents some preliminary estimates of economic values per visit by recreation activity. The economic values reflect the amount recreators would be willing to pay in excess of what they actually paid per visit. Applying these economic values by activity to the estimates of visitation by activity provides a preliminary indication of the total current economic value of recreation at Merritt Reservoir. Based on this information, total economic value attributed to recreation was estimated to be about $5.6 million annually.

Basin-wide Recreation Activities: Recreational opportunities can be found in the area outside of Merritt Reservoir also:

- Snake River: Flows on the lower section of the Snake River downstream of Merritt Reservoir are maintained by releases from Merritt Dam, seepage, stream pick-up, and toe drain flows. Snake River Falls, located downstream from the dam, is the largest falls in the State in terms of water volume despite being less than ten feet tall. Cold water releases from the dam have helped to create a well-known brown and rainbow trout fishery. Public recreational opportunities on the Snake River below Merritt Dam are limited by the lack of public access across private property.

- Niobrara River: The Snake River merges with the larger Niobrara River several miles west of the town of Valentine. Recreational use of the Niobrara River downstream of Valentine is relatively heavy as this section has been designated a National Scenic River. Seventy-six miles of the Niobrara River, from the Borman Bridge near Valentine to the Highway 137 bridge north of Newport, were designated a National Scenic River in 1991. The western one-third of the scenic river section, characterized by steep tree-lined canyons and numerous tributary waterfalls, is very popular for canoeing, hiking, and sightseeing. This section of the Niobrara River has been rated as one of the top ten canoeing rivers in the country. The scenic river corridor consists of mostly private lands but also includes the Fort Niobrara National Wildlife Refuge and Wilderness Area, Smith Falls State Park, and the Nature Conservancy's Niobrara Valley Preserve.

- Fort Niobrara National Wildlife Refuge (NWR) and Wilderness Area (FWS): The 19,123 acre NWR and 4,635 acre wilderness area are located a few miles east of the town of Valentine. The NWR is a favorite put-in spot for canoeists. The sedate portion of the Niobrara River, just east of the NWR, is popular for novice canoeists.

- Smith Falls State Park (Nebraska Game and Parks Commission): Established in 1992, this park located east of the Fort Niobrara National NWR and Wilderness Area 15 miles east of Valentine, provides canoeing and hiking access to Nebraska's tallest waterfall (70+ feet) amid a thick deciduous forest. A few miles downstream of Smith Falls, flows on the Niobrara River increase considerably, resulting in several rapids and portages providing a challenge even for experienced canoeists. Starting at the Fort Niobrara NWR and exiting at Norden Bridge offers over 30 miles of prime canoeing. Beyond the Norden Bridge, the river becomes to shallow and unpredictable for further canoe travel.

- Niobrara Valley Preserve (Nature Conservancy): The 65,000 acre preserve, one of the largest owned by the Nature Conservancy, is located northwest of Ainsworth. The preserve includes a 25 mile stretch of the Niobrara River.

Basin-Wide Recreation Visitation and Value: Table REC 2 in Appendix A presents recent visitor data for the National Scenic River segment of the Niobrara River. Data were obtained from the three sites noted above plus "Other National Scenic River Areas" managed by the National Park Service. Given the limited data and the results of management actions in recent years, the decision was made to use the post year 2000 average as indicative of current visitation. Combining average visitation across the four areas results in an overall estimate of about 121,100 visits

Economic values per visit were indexed to December 2004 dollars using the Midwest region consumer price index. Applying these 2004 values per visit to the estimated visitation by activity provides a preliminary indication of the total current economic value of recreation within the Niobrara National Scenic River corridor. Using this information, total economic value along this stretch of the river is estimated at nearly $6 million annually.

This environmental consequences section presents the consequences to recreation from implementing the Irrigation and FWR Alternatives when compared to the No Action Alternative. Impacts associated with the two action alternatives were measured in terms of facility availability, recreation visitation, and economic value. The effects of the Irrigation and FWR alternatives on instream flows for the Niobrara River were deemed to be relatively insignificant: therefore, the focus of the recreation analysis is on Merritt Reservoir.

Impacts to Merritt Reservoir recreation facility availability were measured by comparing end-of-month water levels by alternative to the high and low end usability thresholds for each of the boat ramps. Admittedly, by working off of end-of-month water levels, this analysis is somewhat simplistic given that it cannot account for daily water level fluctuations. Nevertheless, the analysis does provide a general indication of variation in facility availability between alternatives. Other primarily land-based recreation facilities around the reservoir were assumed not to be significantly affected by fluctuating water levels.

Differences in hydrologic conditions for each alternative were measured by comparing facility availability during average conditions, dry conditions (10th percentile of water levels), and wet conditions (90th percentile of water levels). As dry and wet conditions only occur 10 percent of the time, facility availability during average conditions is emphasized. In addition, the analysis focuses on facility availability during the high recreation season from May through September since better than 85 percent of the annual recreation visitation typically occurs during those months. Table REC 3 in Appendix C presents the results of the facility availability analysis.

Impacts to Merritt Reservoir recreation visitation were measured using a statistical-use estimating model. The model predicts total annual recreation visitation as a function of start of season (April) end-of-month water levels, the change in water levels from April to September, and population within 150 miles of the reservoir. The overall model proved statistically significant. Predictive values for the data for the explanatory or independent variables were all statistically significant and of the expected sign. Data for estimation of the model were obtained from 1980-2004.

Environmental Consequences: Recreation—Plugging alternative specific information concerning water levels into the model allows for the development of annual visitation estimates by alternative and hydrologic condition. Information on the distribution of visitation by recreation activity and economic values per visit were presented in the recreation affected environment section. Combining the model-based visitation results by alternative with the per visit economic values allows for estimation of total recreation economic value by alternative. Table REC 4 in Appendix C contains information on visitation and recreation economic value by alternative, as well as the differences in visitation and value between the Irrigation and FWR Alternatives and the No Action Alternative. In addition, relevant information on the statistical model is presented at the end of the table.

No Action Alternative: Facility Availability—Based on the end-of-month reservoir water levels, during the high recreation season from May (end-of-month April) through September (end-of-month September), under average conditions no boat ramp would be available at the end of August. Under the No Action Alternative and dry conditions, boat ramps would be unavailable during both August and September. Under wet conditions, all ramps would be available across all months.

Visitation and Value—For the No Action Alternative average condition, the model estimated annual visitation at about 133,000 and value at $5.62 million. As would be expected, the model predicted lower levels of visitation (and value) for dry conditions and higher levels for wet conditions.

Irrigation Alternative: Facility Availability—The only difference in boat ramp availability between the Irrigation Alternative and the No Action Alternative would occur during average conditions during

September. The Cedar Bay Boat Ramp would become unavailable under this Alternative. It is possible that this ramp might not adversely impact recreation visitation because another ramp (i.e., Beeds Landing) would still be available for that month. However, access would generally be limited. No differences were identified between the No Action and the Irrigation Alternative during dry and wet conditions.

Visitation and Value—The Irrigation Alternative was estimated to result in slightly lower levels of visitation and value under all three hydrologic conditions. Under average conditions, the loss in visitation and value compared to the No Action Alternative would be 1.5 percent. The losses in visitation and value would be considered minor under each hydrologic condition.

FWR Alternative: Facility Availability—The FWR Alternative would result in additional boat ramp availability under average conditions as compared to the No Action Alternative during August and September. During August, the positive impact of two additional ramps (i.e., Cedar Bay and Beeds Landing) might prove more beneficial than the additional ramp availability in September given the lack of ramp availability in August for the No Action Alternative. Under dry conditions and the FWR Alternative an additional boat ramp would be available (i.e., Beeds Landing) in September. This additional ramp availability might prove to be somewhat important given the lack of September ramp availability for the No Action Alternative. Conversely, the dry condition impact under the No Action Alternative would be likely to prove less detrimental as compared to the increase in ramp availability during average conditions given dry conditions occur only about 10 percent of the time. No difference in ramp availability showed up during wet conditions.

Visitation and Value—The FWR Alternative was estimated to result in somewhat higher levels of visitation and value under average and dry hydrologic conditions. The gains in visitation and value, while greater in both absolute and percentage terms compared to the losses associated with the Irrigation Alternative, were still considered relatively minor under each hydrologic condition. The reader should note that the approximate 12 percent increase in visitation and value associated with the FWR Alternative under dry conditions would only occur 10 percent of the time, thereby considerably reducing its relative level of benefit.

Socioeconomics —The intent of socioeconomic or regional economic impact analysis is to describe the total economic activity within a given geographic area. While numerous measures of economic activity could be considered, the following three measures were used in this analysis:

- Industry Output: Dollar value of production (sales revenues or gross receipts) from each industry;

- Employment: Total of part-time and full-time hourly wage, salary, and self-employed jobs;

- Place of Work Income: Employment income (wages and benefits) derived at the workplace, including self-employed income.

The region encompassing the Unit is defined by the three counties of Cherry, Brown, and Rock in north-central Nebraska.

Table SOCIO 1 in Appendix C presents information from 2001 on output, employment, and place of work income for the three-county region. These data were obtained from the widely-used IMPLAN input-output model. IMPLAN generates information across 509 economic sectors, and these sectors were

combined into 20 aggregated industries for presentation purposes. Overall, the three-county region generated nearly $560 million in output, 7,100 jobs, and $128 million in place of work income in 2001.

The agriculture industry dominates the region in terms of output and is also the largest industry from an employment perspective. However, government provides the most within-region income. Other relatively influential industries include retail trade and construction.

Environmental Consequences: Socioeconomics

No Action Alternative: The No Action Alternative would have no impact on agricultural output or recreational activity when compared to current conditions. Future operations of Merritt Dam and Reservoir under the Irrigation and FWR Alternatives would result in only minor changes in agricultural output and/or recreation activity compared to the No Action Alternative. Therefore, no substantial changes in economic activity would be expected within the region regardless of which alternative were selected.

Irrigation Alternative: This alternative would not affect socioeconomics of the region as explained under the No Action Alternative.

FWR Alternative: This alternative would not affect socioeconomics as explained under No Action.

Threatened or Endangered Species—The following section provides background information on Federally-listed threatened or endangered species and designated critical habitat that may be present in the action area associated with contract renewal or conversion. The action area, generally more expansive than the location of the proposed Federal action, is defined as "all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action" (50 CFR 402.02).

The action area for contract renewal/conversion for the AID includes: (1) Merritt Dam and Reservoir and adjacent lands; (2) Ainsworth Canal and all lands associated with the canal; (3) Snake River and its floodplain from Merritt Dam to its confluence with the Niobrara River; (4) Niobrara River and its floodplain from its confluence with the Snake River to its confluence with the Missouri River; (5) Brown County from U.S. Highway 20 to the Niobrara River and generally between the towns of Johnstown and Long Pine; (6) Long Pine Creek in Rock County; and (7) that portion of the AID in Rock County northeast of the Town of Long Pine.

The action area largely determines the threatened or endangered species and designated critical habitat that should be considered for Endangered Species Act section 7 consultation. The species being considered in this report and their status are:

- Bald eagle (Haliaeetus luecocephalus)—Threatened;
- Interior least tern (Sterna antillarium athalassos)—Endangered;
- Northern Great Plains breeding population of the piping plover (Charadius melodis)—Threatened;
- Whooping crane (Grus americana)—Endangered;
- American burying beetle (Nicrophorus americanus)—Endangered;

- Western prairie fringed orchid (Platanthera praeclara)—Threatened;

- Blowout penstemon (Penstemon haydenii)—Endangered.

Critical habitat for the Northern Great Plains breeding population of the piping plover was designated on the Niobrara River in 2002. The reach of the Niobrara River designated as critical habitat begins at the bridge south of the town of Norden and extends downstream for approximately 120 miles to its confluence with the Missouri River (U.S. Fish and Wildlife Service 2002). The physical primary constituent elements associated with piping plover critical habitat include sparsely vegetated channel sandbars, sand and gravel beaches on islands, temporary pools on sandbars and islands, and the interface with the river (U.S. Fish and Wildlife Service 2002). The U.S. District Court for the District of Nebraska vacated the critical habitat designation for the piping plover in Nebraska on October 13, 2005 and directed the FWS to designate critical habitat only in areas occupied by the piping plover where primary constituent elements are found. Since critical habitat for the piping plover in Nebraska has been vacated, it will not be considered in this report.

Bald eagles are large, opportunistic birds of prey that feed largely upon fish and waterfowl. Eagles tend to use areas along rivers, lakes, and reservoirs where large trees provide perch sites for roosting and for locating and securing prey. Under adverse conditions, bald eagles may search for prey in upland areas or even feed on carrion.

When severe cold conditions persist, eagles will concentrate in areas with open water where waterfowl concentrate or relocate.

Nesting and wintering eagles are found in close association with water that provides a reliable food source and isolation from human activities. Bald eagles wintering in Nebraska are thought to originate in the central provinces of Canada and the Great Lakes states. Migrant and wintering bald eagles begin to arrive in the Niobrara River Basin in early to mid-November and begin to leave the area for breeding areas in the north by early April (U.S. Fish and Wildlife Service 2003). Adult migrants tend to winter repeatedly in the same area, but remain mobile when seeking food during changing winter weather conditions. Wintering and migrating eagles can occur throughout the Niobrara River basin (U.S. Fish and Wildlife Service 2002) and are known to winter at Merritt Reservoir and along the Snake River (U.S. Fish and Wildlife Service 2003).

Bald eagles nest near rivers, lakes, and reservoirs where they select nesting sites free from disturbance. Cottonwood trees are preferred nesting trees in the Niobrara River basin. Nests are large and re-used annually. Nesting activities begin in mid- to late March, eggs are laid in late March to early April, and both adults incubate the eggs (Nebraska Game and Parks Commission 1993a). Eggs hatch in mid-May and fledging takes place after ten to eleven weeks, with immature birds remaining near the nest for another six weeks (Nebraska Game and Parks Commission 1993a).

The number of active bald eagle nests in Nebraska is increasing. The closest active bald eagle nest to the Merritt Reservoir and the AID is located in Boyd County near the confluence of the Niobrara and Keya Paha Rivers (U.S. Fish and Wildlife Service 2002). An active nest is also located in Knox County at the confluence of the Niobrara River and Schindler Creek (U.S. Fish and Wildlife Service 2002). The bald eagle is listed as threatened and has been proposed for de-listing.

The interior least tern is the smallest member of the tern family and breeds on the Niobrara River in colonies with piping plovers (U.S. Fish and Wildlife Service 2002). Breeding least terns are normally associated with unvegetated shorelines, sandbars, and mudflats of rivers, and sand and gravel pits. The occurrence of breeding least terns is localized, being highly dependent on the presence of dry, exposed

sand and gravel bars and favorable river flows that support a forage base and isolate bars from the banks. Characteristic riverine nesting sites are dry, flat, sparsely vegetated sand and gravel bars within a wide, unobstructed, water-filled river channel. This swallow-like aquatic bird feeds primarily on small fish, such as shiners (Notropis spp.) and plains killifish (Fundulus kansae), found in shallow water in rivers and lakes (Nebraska Game and Parks Commission 1997).

Nebraska supports one of the largest populations of least terns in the interior United States with distribution scattered throughout the main stem Missouri, Platte, Loup, Niobrara, and Elkhorn Rivers (Nebraska Game and Parks Commission 1997). They can be found nesting among colonies of piping plovers on the Niobrara River on naturally-occurring sandbars from Fort Niobrara National Wildlife Refuge downstream to the Missouri River (U.S. Fish and Wildlife Service 2002, 2003). The nesting season begins in mid-April and extends through mid-August (U.S. Fish and Wildlife Service 2003). The number of least terns found during surveys of the Niobrara River ranged from 12-190 since 2001 (Table 12). The interior least tern is listed as endangered.

	Niobrara National Scenic River		Lower Niobrara River	
	Piping Plovers	**Least Terns**	**Piping Plovers**	**Least Terns**
2001			87	150
2002	15	15		
2003	18	12	24	40
2004	18	26	36	64
2005	26	30	74	190

Sources: U.S. Fish and Wildlife Service 2002; National Park Service 2002, 2003, 2004, 2005; Nebraska Game and Parks Commission 2005; Wilson 2003; Wilson and Pool 2004.

Table 12. Piping plover and least tern survey data – Niobrara River

The piping plover is a migratory shorebird that breeds along prairie rivers, alkali lakes and ponds of the northern Great Plains, on sandy beaches along the Great Lakes, and on the beaches of the Atlantic coast. Its primary food is aquatic invertebrates. It is believed that the northern Great Plains population of the piping plover winters along beaches and mudflats from Florida to northern Mexico (Nebraska Game and Parks Commission 1995b).

Piping plover populations have fluctuated drastically since 1900 primarily as the result of market hunting. Populations rebounded by the 1920s; however, human encroachment, an increase in the recreational use of sandbars and beaches, channelization and impoundment of rivers, and the resultant modification and destruction of habitat have contributed to their decline again.

The piping plover's historic breeding habitat in Nebraska included the Missouri and Platte Rivers, parts of the Loup Rivers, and a portion of the Niobrara River (Nebraska Game and Parks Commission 1995b). It can be found nesting among colonies of least terns on the Niobrara River on naturally-occurring sandbars from Fort Niobrara NWR downstream to the Missouri River (U.S. Fish and Wildlife Service 2002, 2003). The nesting season begins in mid-April and extends through mid-August (U.S. Fish and Wildlife Service 2003). The number of piping plovers identified through surveys of the Niobrara River ranged from 15 to 190 since 2001 (Table 12). The piping plover is listed as threatened.

The whooping crane is one of the rarest North American birds. The whooping crane is the tallest North American bird at approximately five feet tall when standing erect, with a wingspan approaching eight feet. The breeding population of the whooping crane nests in Wood Buffalo National Park in the

Northwest Territories and winters at Aransas NWR and at other locations along the Gulf Coast of Texas (Lewis 1995). Whooping cranes seasonally migrate through north central Nebraska.

Cranes roost overnight on exposed bars or on submerged bars in shallow water in the Niobrara River and wetlands during migration. The whooping crane is most likely present within the action area as a common spring (March-May) and fall (October-November) migrant and through Nebraska and the Niobrara River basin where they use wetlands, open agricultural fields, and grasslands that provide unobstructed views of the surrounding terrain that are isolated from human disturbance (Nebraska Game and Parks Commission 1994a). The Ainsworth Unit is situated within the traditional crane migration corridor (U.S. Fish and Wildlife Service 2003).

Cranes use the Niobrara River downstream of Valentine and in Holt County (U.S. Fish and Wildlife Service 2002). The most frequent confirmed observations occur between the Norden and Carns bridges (U.S. Fish and Wildlife Service 2002). Fourteen whooping crane sightings have been confirmed on and along the Niobrara River between Valentine and Mariaville (Nebraska State Highway 137 bridge) (U.S. Fish and Wildlife Service 2003). Nine cranes were observed on the Niobrara River near the Carns Bridge in 2003 and 2004 (Jobman 2004). The reach of the Niobrara River between Meadville and Mariaville was proposed as critical habitat for the whooping crane in 1978 (U.S. Fish and Wildlife Service 1978); however, the proposal was withdrawn in 1979 (U.S. Fish and Wildlife Service 1979).

Fish and Wildlife Service (2003) records also indicate that whooping cranes sightings have been confirmed on or near the AID between the towns of Johnstown and Long Pine at the following locations:

1. Five cranes at a location three miles west and three miles south of Ainsworth during October 21-23,1997;

2. Two cranes at a location one mile west and one mile south of Ainsworth during March 28-April 1, 1998;

3. Five cranes at a location four miles west and one mile south of Ainsworth during October 23-November 2, 2000; and

4. Six cranes at a location one mile east and two and one-half mile north of Long Pine on October 28, 2002.

Collision with power lines is the primary known cause of death for whooping cranes (Lewis 1995). The frequent stopovers necessary for migration have become increasingly hazardous as more land is developed for agriculture, industry, and housing. Suitable resting sites along their migration routes decrease every year. The whooping crane is listed as endangered.

The American burying beetle is the largest carrion-frequenting insect in North America, reaching a length of one and one-half inches. Adult beetles are nocturnal and search widely for carrion. Beetle reproduction is closely tied to carrion with larvae living in and feeding on it. The American burying beetle is unique among insects outside of the social bees, wasps, and ants in that it cares for and feeds its young.

American burying beetles are known to occur in Rhode Island, Arkansas, Oklahoma, South Dakota, and Nebraska, and are thought to inhabit level areas in grasslands and open woodlands. The westernmost North American record for the American burying beetle comes from near North Platte, Nebraska, with recent sightings from Lincoln, Dawson, Custer, Gosper, Frontier, Thomas, Keya Paha, and Cherry Counties (U.S. Fish and Wildlife Service 1997, Nebraska Game and Parks Commission 1995a). The

American burying beetle is known to occur in the Niobrara River Basin in Boyd, Brown, Cherry, Holt, Keya Paha, and Rock counties (U.S. Fish and Wildlife Service 2002). In Nebraska, beetles have been collected in grassland, mixed grassland/cropland, and riparian woodland.

Suethen and Hoback (2003) surveyed 27 counties in Nebraska in 2001 to determine the present range of beetles in Nebraska. The survey collected beetles from ten counties and extended their eastern range in Nebraska by approximately 150 miles. One beetle was collected in hilly, coniferous habitat in Rock County. Five beetles were collected in Brown County along the Calamus River south of the action area, and one beetle was collected at the Bobcat Wildlife Management Area south of Niobrara. No beetles were collected from Cherry County during this survey, although they have been previously collected in this county. Most of the specimens were collected from low-lying prairie near water. Suethen and Hoback (2003) suggest that—based on their survey—Nebraska and South Dakota contain the largest remaining population of American burying beetles in North America.

Vegetation does not appear to limit the distribution of the American burying beetle; rather, it requires areas relatively undisturbed by human influence. Undisturbed habitat and the availability of carrion appear to most strongly influence beetle distribution (U.S. Fish and Wildlife Service 1991). Habitat fragmentation appears to adversely affect beetles by altering species composition, lowering their reproductive success, and by introducing additional "edge" and competition from other scavengers. Specific habitat requirements for the American burying beetle are unknown; however, it is believed that carrion availability and abundance may be more important that structural habitat (Nebraska Game and Parks Commission 1995a).

There have been no confirmed collections of the American burying beetle within the action area (U.S. Fish and Wildlife Service 2003, Suethen and Hoback 2003). Field surveys are scheduled for spring and fall 2006. Surveys results will be disclosed in the final EA and in the biological assessment prepared for the ESA section 7(a)(2) consultation process. The American burying beetle is listed as endangered.

The western prairie fringed orchid is a relatively tall, perennial plant inhabiting tall-grass, calcareous silt loam or sub irrigated sand prairies (U.S. Fish and Wildlife Service 2002). In eastern Nebraska, the orchid occurs in mesic upland prairies in glacial drift and calcium-rich loess soils (Nebraska Game and Parks Commission 1993b). In central and northeast Nebraska, it occurs in wet-mesic prairies and sedge meadows in alluvial soils of river floodplains (Nebraska Game and Parks Commission 1993b). In the Sandhills of central and western Nebraska, the orchid has been observed growing in undisturbed sub irrigated meadows (U.S. Fish and Wildlife Service 2003). All sites are characterized by tall grass prairie habitat and abundant soil moisture. Populations of the western prairie fringed orchid are found primarily in high to moderate quality, unplowed prairies.

The major limiting factor for the western prairie fringed orchid is its dependence on mesic to wet-mesic tall grass prairie habitat (Nebraska Game and Parks Commission 1993b). Long-term survival requires sites with near-surface ground water to maintain a relatively high and consistent level of saturation. Wetland drainage, stream channelization, ditching, and pumping from shallow aquifers pose threats to the orchid by depleting ground water and reducing near-surface soil moisture. Reduced or interrupted stream flows also pose a threat through drying of adjacent meadows (Nebraska Game and Parks Commission 1993b).

A number of populations are known to occur in Cherry County. Within the Niobrara River basin, populations are found on the Valentine NWR, northwest of Wood Lake, and near Steverson Lake (U.S. Fish and Wildlife Service 2002, 2003). Field surveys in July 2003 identified 252 acres of potential western prairie fringed orchid habitat in the action area; however, no plants were located during the survey or none are otherwise known to exist in the action area (Ecosystems Research Institute 2003).

Surveys were not possible along the Snake River below Merritt Reservoir in 2003 because permission was not granted for access to private property, and it is not known whether western prairie fringed orchid populations exist along the lower Snake River. Additional field surveys are scheduled for summer 2006. The results of these surveys will be disclosed in the final EA and in the biological assessment prepared for the ESA section 7(a)(2) consultation process. The western prairie fringed orchid is listed as threatened.

The blowout penstemon is the rarest plant species native to the Great Plains and is found only in the Sandhills of Nebraska and in one isolated population in central Wyoming (Nebraska Game and Parks Commission1997). Blowout penstemon is a member of the snapdragon family and grows from one to two feet high (U.S. Fish and Wildlife Service 1987). The stems are often decumbent, simple or branched, and very leafy. The inflorescence is a compactly crowded thyrse with ovate to lanceolate bracts. The blue corolla is one and one-half to two inches long. Blowout penstemon flowers from mid-May to June and is one of only two fragrant penstemons of the 300 known species found worldwide (Nebraska Game and Parks Commission 1997).

Blowout penstemon was once common in the Sandhills, but now is restricted to populations in Box Butte, Cherry, Garden, Morrill, and Thomas counties. By the 1940s it was thought to be extinct, but was rediscovered in 1968. Where found, it inhabits bare sand in the bowl of dune blowouts and may be found around the rims of blowouts where sand accumulates. It may also be found in association with blowout-grass (Redfieldia flexuosa) and lemon scurfpea (Psoralea lanceolata). It is a short-lived perennial often found growing in large, multi-stemmed clumps. It is frequently confused with shell-leaf penstemon (Penstemon grandiflorus) and narrow penstemon (Penstemon angustifolius) which are both found in the Sandhills (Nebraska Game and Parks Commission 1997).

Habitat for blowout penstemon has greatly decreased since settlement of the Sandhills. Fires and bison grazing historically exposed dune sand to winter and spring winds maintaining habitat for recolonization (Nebraska Game and Parks Commission 1997). With a decrease in prairie fires, vegetative cover has thickened and areas of open sand have declined. Blowout penstemon remains in only a few sites where wind erosion has maintained active blowouts. The primary threat to its long-term survival is sand and dune management.

Seven known populations are located on, or in the vicinity of, Valentine NWR in Cherry County (U.S. Fish and Wildlife Service 2002). Field surveys in July 2003 identified 14 acres of potential blowout penstemon habitat in the action area; however, no plants were located during the survey (Ecosystems Research Institute 2003). Additional field surveys are scheduled for summer 2006. The results of these surveys will be disclosed in the final EA and in the biological assessment prepared for the ESA Section 7(a)(2) consultation process. The blowout penstemon is listed as endangered.

***Environmental Consequences: Threatened or Endangered Species*—**This section describes the anticipated impacts to threatened or endangered species that would result from implementation of the action alternatives. The regulations for implementing NEPA require that impacts of the action alternatives be compared to the environmental conditions that are anticipated to result from the No Action Alternative. The regulations for implementing the ESA require a slightly different analysis where the proposed action or preferred alternative is compared to existing environmental conditions. Because different "baselines" are required by the two statutes, the results of impact analyses do not necessarily reach the same conclusion.

No Action Alternative: The No Action Alternative would allow for full use of storage water at Merritt Reservoir based on irrigation demands with no minimum pool elevation. The reservoir is filled to elevation 2944.0 feet each fall and kept at that elevation through winter. Routine operations and maintenance activities would continue as currently practiced by the AID.

The No Action Alternative would maintain the current operational scenario of Merritt Reservoir and the AID with no change in projected future operations. Releases to the Snake River would be made in a manner similar to those made over the previous 40 years and as further described earlier in the Project Operations and Water Supply Section and shown in Figure 6. Reservoir releases made during the growing season (April–September) would continue to support potential western prairie fringed orchid populations along the Snake River downstream of Merritt Dam. The fluctuating zone of inundation at Merritt Reservoir would not change, and habitat values in the zone of fluctuation for American burying beetle would continue to be low to non-existent.

Because much of the flow in the Niobrara River results from ground water discharge and is minimally regulated, flow volume and timing is not anticipated to change substantially and would generally be sufficient to maintain existing migration and breeding habitat values for whooping cranes, piping plovers, and least terns. March and April releases from Merritt Dam, respectively, constitute approximately 20 percent of the flow in the Niobrara River at Norden and approximately ten percent of flows downstream at Spencer. The ROM hydrology model outputs indicates that the No Action Alternative might reduce Snake River flows in March and April by approximately eight and two cfs, respectively, potentially reducing their contribution to Niobrara River flows at both Norden and Spencer by approximately one percent.

Over the period of record since Merritt Dam was constructed (1965-2004), the Snake River has contributed 19 percent, 11 percent, and ten percent of Niobrara River flows in June, July and August, respectively, at Norden. During the same months, the Snake River contributes ten percent, six percent, and six percent of flows downstream at Spencer.

The No Action Alternative potentially reduces this contribution to 14 percent in June at Norden and to 7 percent at Spencer; remains unchanged at both locations in July; and potentially increases its contribution in August to 12 percent at Norden and to 7 percent at Spencer. Lower flows when plovers and terns initiate nesting in June and higher flows in August could potentially inundate some sand bars supporting unfledged chicks; however, increasing average daily August flows by up to two percent would not be expected to inundate nest sites established during higher flows in June. Daily flow in June at Norden during the period of record averages 892 cfs and 596 cfs in August. Flows downstream at Spencer average 1,656 cfs daily in June and 1,019 cfs daily in August. An increase of up to two percent in August daily flows should not completely inundate bars that were high enough during June flows to support nesting nor completely eliminate refuge for unfledged chicks. Terns and plovers currently experience considerable nest disruption and mortality from thunderstorms and other high flow events unrelated to Merritt Reservoir releases and Snake River flows (National Park Service 2005). Such unrelated disruption and mortality would be likely to continue under the No Action Alternative.

The winter reservoir surface area at Merritt would remain at 2,692 acres at elevation 2944.0 feet. Wintering bald eagles would continue to be able to forage at Merritt Reservoir when the reservoir is not completely frozen. Winter releases from Merritt Reservoir that support fish and waterfowl for foraging eagles are not anticipated to change from current winter releases (see discussion of hydrology model output earlier in the Project Operations and Water Supply Section). Existing native and tame grasslands would not be converted to croplands maintaining existing habitat values for the American burying beetle, western prairie fringed orchid, and blowout penstemon. Channel degradation in Sand Draw and Bone and Long Pine creeks would continue to discharge sediment into the Niobrara River, arguably providing minimal habitat benefits for piping plovers, least terns, and whooping cranes.

Irrigation Alternative: Under this alternative routine, operations and maintenance activities conducted by the AID would be the same as those under the No Action Alternative. This alternative would allow full use of storage water at Merritt Reservoir based on irrigation demands with no minimum pool

elevation. The reservoir would be filled to elevation 2944 feet each fall and kept at that elevation through winter.

The hydrologic model indicates that reservoir releases to the Snake River and their contribution to Niobrara River flows at Norden and Spencer would be slightly less than—but similar to—the No Action Alternative. Because of the relatively small contribution from the Snake River, migrating whooping cranes and breeding piping plovers and least terns would not be adversely impacted. Because flow changes are minimal during the growing season, adverse impacts to potential western prairie fringed orchid populations along the Snake River, if there are any, would not be anticipated.

FWR Alternative: Under this alternative, the long-term water service contract with the AID would be renewed or converted to a repayment contract, and a minimum pool elevation of 2929.0 feet would be established in Merritt Reservoir. The reservoir would be filled to elevation 2944.0 feet each fall and kept at that elevation through winter. Routine operations and maintenance activities conducted by the AID would be the same as the No Action Alternative.

The impacts associated with this alternative would be similar to the No Action Alternative, with the exception that higher minimum reservoir elevations might support a larger reservoir forage base for wintering bald eagles. Providing flows to improve aquatic habitat below Merritt Dam might also benefit wintering bald eagles by maintaining or improving the forage base in the Snake River and might improve habitat conditions for potential western prairie fringed orchids. Slightly higher flows in the Snake River indicated by the hydrologic model would maintain flow contributions to the Niobrara River as described under the No Action Alternative.

Cultural Resources—Cultural resources are the physical remains of a people's way of life that archaeologists and historians study to interpret how people lived. Cultural resources in the Unit are administered under the National Historic Preservation Act of 1966 (NHPA, as amended) and the Archeological Resources Protection Act (ARPA, as amended). Each act has implementing regulations that specify consultation and protection procedures.

Under Section 106 of NHPA, Reclamation must consult with the State Historic Preservation Officer, the Advisory Council on Historic Preservation Officer, and the Advisory Council on Historic Preservation when a proposal could affect historic properties listed, or eligible for listing, in the National Register of Historic Places. Section 110 of NHPA requires Federal agencies to manage and maintain historic properties on Federal land in a way that considers their historic, archeological, architectural, and cultural value, and to consider the effects of proposed actions during project planning.

Section 110 (a)(2) of NHPA and the Department of the Interior's "Guidelines for Federal Agency Responsibilities under Section 110 of the National Historic Preservation Act" require a Class III cultural resource survey of all Federal lands. Thirty-five previous surveys have been completed on portions of the Unit, primarily on small tracts examined in advance of construction activities.

For the purposes of this contract renewal or conversion for the AID, the Area of Potential Effect (APE) has been established to include: (1) Merritt Dam and Reservoir and adjacent lands; (2) Ainsworth Canal and all lands associated with the canal; (3) Snake River and its floodplain from Merritt Dam to its confluence with the Niobrara River; (4) Niobrara River and its floodplain from its confluence with the Snake River to its confluence with the Missouri River; (5) Brown County from U.S. Highway 20 to the Niobrara river and generally between the towns of Johnstown and Long Pine; (6) Long Pine Creek in Rock County; and (7) that portion of the AID in Rock County northeast of the Town of Long Pine.

Certain components of cultural resources have been identified with specific legislation. Two of these components deal with the discovery of human remains and Native American sacred sites. While neither of these types of cultural resources have been identified in the AID, a brief discussion of these is included. Reclamation is responsible for the protection and final disposition of funerary remains and certain cultural objects located on Federal land under the Native American Graves Protection and Repatriation Act (NAGPRA) of 1990. Cultural objects under this act include funerary objects, sacred objects, and objects of cultural patrimony. Any intentional removal of protected remains or sacred objects requires consultation with American Indian Tribes and Native Americans that might be culturally-affiliated with these objects. Removal can take place only after consultation is completed and an ARPA permit is issued by the Federal agency administering the land. Inadvertent discoveries require protection of the remains and consultation with the relevant Indian Tribes. Materials protected by NAGPRA are conveyed to the closest-affiliated person or tribe for final disposition.

Reclamation is responsible for the protection of and access to native American sacred sites as identified in Executive Order 13007, Indian Sacred Sites. Reclamation has defined that any specific, discrete, narrowly delineated location on Federal land that is identified by an Indian tribe, or Indian individual determined to be an appropriately authorized representative of an Indian religion, as sacred by virtue of its established religious significance to, or ceremonial use by, an Indian religion, provided that the tribe or appropriately authorized representative of an Indian religion has informed the agency of the existence of such a site.

A records search for all project land was performed by Reclamation and the University of Nebraska through the Nebraska State Historical Society. Files at Reclamation's Nebraska-Kansas Area Office were also carefully examined. Records searches, as well as the two comprehensive Class III cultural resource surveys, have identified approximately 50 archeological sites that had been recorded within the Unit. Several other archeological sites have been recorded in adjacent sections. Two comprehensive Class III surveys each produced a report for the archeological surveys as well as site evaluations on all Federal lands and easements within the potential area of impact, one for Merritt Reservoir and one for the Ainsworth Canal and Lateral system.

Environmental Consequences: Cultural Resources

No Action Alternative: There would be no net impacts to cultural resources under this alternative.

Irrigation Alternative: This alternative would not affect cultural resources as explained under the No Action Alternative.

FWR Alternative: This alternative would not affect cultural resources as explained under No Action.

Indian Trust Assets — Indian trust assets (ITAs) are legal interests in property held in trust by the United States for Indian tribes, nations, or individuals. The Secretary of the Interior is the trustee for the United States on behalf of Indian Tribes. All Department of the Interior agencies share the Secretary's duty to act responsibly to protect and maintain ITAs reserved by or granted to Indian tribes, nations, or individuals by treaties, statutes, and executive orders. These rights are sometimes further interpreted through court decisions and regulations. Examples of ITAs are lands, minerals, hunting and fishing rights, and water rights. Interior carries out its activities in a manner that protects ITAs and avoids adverse impacts when possible. When adverse impacts cannot be avoided, appropriate mitigation or compensation is to be provided in consultation with the affected tribes and/or individuals.

Environmental Consequences: Indian Trust Assets

No Action Alternative: Consultation initiated in 1995 did not identify any ITAs in the project area. Follow-up research in 2004 confirmed that there were no ITAs in the area.

Irrigation Alternative: There are no ITAs in the project area.

FWR Alternative: There are no ITAs in the project area.

Environmental Justice —This report, as mandated by Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," addresses potential environmental justice concerns related to the renewal or conversion of the AID's long-term water service contract. The executive order requires Federal agencies to identify and address any disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority and low-income populations.

Environmental Consequences: Environmental Justice

No Action Alternative: Renewal or conversion of long-term water service contracts would not be expected to disproportionately affect minority or low-income populations. Minority populations constitute about 6.9 percent of the Unit and are mainly in urban centers. The proposed contract terms and provisions would not involve the construction of new facilities, cause the relocation of any populations, result in property takings, or generate any substantial economic impacts.

Regardless of which alternative is selected, the proposed renewal or conversion of the AID's long-term water service contract would not have an adverse effect on human health or the environment, as defined by environmental justice policies and directives.

Irrigation Alternative: This alternative would not affect environmental justice as explained under the No Action Alternative.

FWR Alternative: This alternative would not affect environmental justice as explained under No Action.

Cumulative Impacts

Cumulative impacts are impacts on the environment which result from incremental effects of an action when added to other past, present, and reasonable foreseeable future actions regardless of which agency or person undertakes them.

Water quality sampling results in the Ainsworth Unit indicate aluminum (a metallic element) at concentrations exceeding aquatic life criteria. Potential impacts of aluminum transport into the Niobrara River are not known; however, there is no evidence to suggest aluminum levels in invertebrates or vertebrates in the Niobrara River is adversely impacting crane, plover, tern, or eagle populations or their forage base. Reclamation is not aware of other sources of heavy metals in the Niobrara River basin that could contribute to metal concentrations in these species' forage base. Likewise, Reclamation is not aware of reasonably foreseeable actions in the Niobrara River basin that could impact flow volume or timing in the Niobrara River.

No cumulative effects on the other resources within the Unit have been identified as a result of renewing or converting the AID's long-term water supply contract.

Environmental Commitment Plan

A habitat survey for the American burying beetle, blowout penstemon, and prairie fringed orchid will be coordinated by Reclamation at Merritt Reservoir, along the Ainsworth Canal, and on project lands within the AID. If any of these species are located as a result of these surveys, Reclamation will consult with FWS under Section 7 (a)(2) of the ESA.

Chapter IV
Consultation and Coordination

Introduction

This chapter describes Reclamation's public involvement activities, consultation and coordination with State and Federal agencies during planning and preparation, and the list of preparers of this environmental assessment.

Public Involvement

Reclamation initially developed a public involvement plan for the proposed title transfer process. The public involvement goals included: (1) identify and involve the diverse interests at the onset and throughout the process; (2) identify issues and concerns early in the process; (3) provide pertinent information to publics to keep them informed and help them form educated opinions; (4) help the public understand how their input affects the process and outcome; and (5) provide forums for publics to discuss various issues and differing viewpoints. The plan was written so it could easily be adapted to respond to evolving issues and to accommodate public needs.
On February 16, 2005 the AID board passed a resolution requesting renewal or conversion of their long-term water service contract in lieu of title transfer. Reclamation believes that much of the environmental data and public input collected for title transfer is relevant to the proposed contract renewal action, and is useful in the environmental review process. The public involvement plan was adapted to fit the contract renewal/conversion process.

Public Meetings

Reclamation initially held public scoping meetings for title transfer in April and May 2003 at Valentine and Ainsworth, Nebraska. Ideas, issues, and concerns were identified and recorded at these meetings. Based on a review of the input gathered at the meetings, Reclamation believes that much of the environmental data and public comments collected for title transfer are relevant to the proposed contract renewal or conversion.

Related Public Outreach

Reclamation periodically publishes a contract renewal newsletter titled "Ainsworth Unit Bulletin." The newsletter answers questions raised by the public and keeps them apprised of the contract renewal or conversion process and related issues. Reclamation also offers information via the Internet at http://www.gp.usbr.gov or by contacting Judy O'Sullivan, Public Affairs, at 308-389-5307.

Consultation and Coordination

As part of the NEPA compliance process, Reclamation consulted with many Federal, State, and local agencies, including the Service, the Commission, the Nebraska DEQ, the National Park Service, and the Nebraska State Historic Preservation Office. Reclamation also consulted with Native American Tribes.

The NEPA compliance process includes consideration of and compliance with the following:

American Indian Religious Freedom Act of 1978 (P.L. 95-341)
National Historic Preservation Act of 1966 (P.L. 89-665), as Amended 1992 (P.L. 102-575)
Native American Graves Protection and Repatriation Act (P.L. 101-601)
Archaeological and Historic Preservation Act (P.L. 93-291)
Archeological Resources Protection Act of 1979 (P.L. 96-95)
National Environmental Policy Act of 1969 (42 USC 4321)
Clean Air Act (33 USC 7401) and Amendments
Clean Water Act (33 USC 1251 et seq.), Sections 401, 402, and 404
Safe Drinking Water Act (42 USC 300f)
Endangered Species Act of 1973 (P.L. 93-205)
Farmland Protection Policy Act (P.L. 97-98)
Fish and Wildlife Coordination Act of 1958 (PL 85-624)
Executive Order 11988 - Floodplain Management (1977)
Executive Order 11990 - Protection of Wetlands (1977)
Executive Order 12898 - Environmental Justice (1994)
Executive Order 13007 - Indian Sacred Sites (1996)
Executive Order 11593 - Protection and Enhancement of the Cultural Environment (1971).
Executive Order 13186- Protection of Migratory Birds
Indian Trust Responsibilities (512 DM Chapter 2)

The National Historic Preservation Act of 1966 (as amended in 1992) requires Federal agencies to consult with the Advisory Council on Historic Preservation concerning potential effects of Federal actions on historic properties. Reclamation has initiated consultation with the State Historic Preservation Office and others concerning cultural properties.

In compliance with ESA, Reclamation is preparing and will submit a biological assessment on contract renewal or conversion and continued project operations to the FWS. The appropriate level of consultation will be completed before the contact is renewed or converted.

Because none of the alternatives involved development in the flood plain or in wetlands as described in Executive Order 11898 and 11990, respectively, this action complies with these executive orders. This action does not adversely impact migratory birds and complies with Executive Order 13186.

Tribal Consultation

Reclamation began tribal consultation with a total of 14 Native American Tribes identified as having known historic and/or prehistoric occupation in the project area. The tribal consultation was initiated on June 15, 2005 with a letter sent to the tribes describing the project. Follow-up conversations with tribal representatives continue. Additional information has been supplied to tribal representatives following several requests. While the consultation process continues, Reclamation has not yet received any negative comments regarding renewing or converting the long-term water service contract. Several tribes have expressed an interest in receiving the DEA during the 30-day review period.

Draft Environmental Assessment Public Inspection and Review Location

The Contract Renewal Draft Environmental Assessment Distribution List is shown in Appendix D. A copy of the DEA will be available for review at the following locations:

Offices
Bureau of Reclamation, Nebraska-Kansas Area Office, 203 West Second Street, Grand Island, Nebraska 68801; telephone 308-389-5307.

Bureau of Reclamation, Great Plains Regional Office, 316 North 26th Street, Billings, Montana 59101; telephone 406-247-7638.

Bureau of Reclamation, McCook Field Office, 1706 West 3rd, McCook, Nebraska 69001; telephone 308-345-1027.

Ainsworth Irrigation District, one mile east of Ainsworth and ¼ mile north, Ainsworth, Nebraska 69210; telephone 402-387-2440

Libraries
Valentine Public Library, 324 N Main, Valentine, Nebraska 69201; telephone 402-376-3160

Ainsworth Public Library, 445 N Main St, Ainsworth, Nebraska 69210; telephone 402-387- 2032

City Offices
Valentine City Clerk, 323 N Main Street, Valentine, Nebraska 69201; telephone 402-376-2323

Ainsworth City Clerk, 606 E 4th St, Ainsworth, Nebraska 69210; telephone 402-387-2494

Website
Bureau of Reclamation – www.gp.usbr.gov (Current Activities – Environmental Activities)

List of Preparers

Bill Chada, Nebraska-Kansas Area Office Archeologist prepared the cultural resources and Native American Indian Trust Asset information.

Gary Davis, Great Plains Regional Office Environmental Specialist, provided information on threatened and endangered species and NEPA compliance.

Rob Davis, Denver Economist, prepared the agricultural economics and socioeconomic information.

Richard J. (Rick) DeVore, Great Plains Regional Office Hydraulic Engineer, prepared the hydrology modeling.

Jeffery M. Lucero, Great Plains Regional Office Water Quality Program Coordinator, assembled the water quality information.

Jill Manring, Nebraska-Kansas Area Office Natural Resource Specialist, provided technical oversight in the preparation of the NEPA document and provided information on wildlife, fisheries, vegetation, and wetlands.

Judy O'Sullivan, Nebraska-Kansas Area Office Public Affairs Specialist, prepared a public involvement plan and newsletter and directed the public involvement activities.

Bill Peck, Nebraska-Kansas Area Office Supervisory Hydraulic Engineer, provided information on Merritt Reservoir and Ainsworth Irrigation District operations.

Jonathan Platt, Denver Economist, prepared the recreation and socioeconomic information.

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Appendixes

Appendix A: Detailed Methodology for Determining Irrigation Benefits

Appendix B: Nebraska Game and Parks Commission Fish Survey Results on the Snake River Below Merritt Dam 1973-1997

Appendix C: Detailed Methodology for Determining Recreation and Socioeconomic Benefits

Appendix D: Contract Renewal Draft Environmental Assessment Distribution List

Appendix A: Methodology for Determining Economic Impacts

Prepared by Rob Davis, Economist,
U.S. Bureau of Reclamation

Introduction

There are three counties that the Ainsworth Irrigation District lies within; Brown, Cherry, and Rock Counties. These counties are in north-central Nebraska and encompass about 8,246 square miles. The total population of the three counties is 11,429 people with 3,525 residing in Brown County, 6,148 in Cherry County, and 1,756 in Rock County. These three counties account for almost 10.7 percent of the total land area for the state of Nebraska (77,354 square miles), but only 0.7 percent of the state's total population of 1,711,263 people (2000 Census of Population).

According to the 2000 Census of Population, urban dwellers (primarily in Cherry County) made up 24.0 percent of the county's population, with the remaining 76.0 percent of the total population being rural.

Ainsworth Irrigation District

The Ainsworth Irrigation District has project lands extending 22 miles from west to east from Johnstown, Nebraska to just east of Long Pine, Nebraska. Water storage for the district comes from Merritt Dam and Reservoir which is southwest of Valentine, Nebraska. There are a total of approximately 35,000 acres within the irrigation district which are serviced by the Ainsworth Canal. The Ainsworth Canal is 53 miles long and has an additional 174 miles of laterals.

The primary crops in the district include corn, corn silage, soybeans, and alfalfa hay. According to Ainsworth Irrigation District records, corn (on average) is produced on 23,570 acres. Corn silage is produced on 4,267 acres, there are 5,850 acres of soybeans and about 650 acres of alfalfa hay. The Ainsworth Irrigation District accounts for 33.7 percent of all irrigated corn production for Brown, Cherry and Rock Counties. Corn silage accounts for about 95 percent of all irrigated corn silage production for the three-county area. Soybeans grown in the irrigation district boundaries account for 29.0 percent of all irrigated soybean acreage. Alfalfa hay is produced in the irrigation district, but makes up a very small percentage of the total alfalfa hay acreage for the three counties.

Yields for the crops grown in the irrigation district are, in general, slightly higher than the county average yield reported by the Nebraska Agricultural Statistics Service. Corn yields in the irrigation district averaged 154.7 bushels per acre, corn silage yields averaged 23.7 tons per acre, soybeans averaged 49.7 bushels per acre, and alfalfa hay averaged 4.65 tons per acre.

Census of Agricultural Data

Farming was listed as the primary occupation for the majority farmers in all three counties. However, almost one-half the farmers in Brown County obtained some of their annual income from off-farm sources. About one-third the farmers in Cherry County had off-farm work, as did about 40 percent of the farmers in Rock County.

Census of Agriculture data, at the county level, was available for 1987, 1992 and 1997. In 1987, Brown County had 344 farms, Cherry County had 745 farms, and Rock County had 313 farms. In 1992, the number of farms in each county decreased (Brown – 332; Cherry – 676; and Rock – 316). The number of farms increased in 1997 for Brown (349) and Rock (316) Counties, but decreased for Cherry (672) County.

Total land in farms in 1987, 1992, and 1997 for each county was as follows: Brown County had 562,857 acres in 1987, 649,634 acres in 1992, and 700,954 acres in 1997. Cherry County had 3,962,751 acres in farms in 1987, 3,887,635 acres in farms in 1992, and 3,881,831 acres in 1997. Rock County had 582,745 acres in 1987, 657,906 in 1992, and 631,119 in 1997.

The average farm size in 1987 was 1,636 acres, 5,319 acres, and 1,862 acres for Brown, Cherry, and Rock Counties, respectively. In 1992, the average farm size increased for each county (Brown – 1,957; Cherry – 5,751; and Rock – 2,122). In 1997, the average farm size increased for Brown and Cherry Counties to 2,008 and 5,777 acres while Rock County decreased to 1,997 acres.

The estimated average value of land and buildings per farm for Brown County went from $538,945 in 1987 to $587,275 in 1992 to $725,889 in 1997. On a per-acre basis, the average market value of land and buildings in Brown County was $329, $292, and $364 in 1987, 1992, and 1997, respectively. For Cherry County, average value of land and buildings was $1,302,352, $1,060,035, and $1,153,465 for 1987, 1992, and 1997, respectively; the per-acre values were $248, $182, and $200. Rock County had average market values of $454,911, $447,170, and $580,601; per-acre values were $266, $218, and $281.

The 1997 agricultural census showed 134 farms in Brown County had irrigated land as part of their farm. Total land for these 134 farms came to 234,438 acres. Harvested cropland on these 134 farms totaled 71,266 acres. On the harvested cropland, 50,662 acres (71.1 percent) were irrigated and harvested. In Cherry County in 1997, 103 farms had irrigated land as part of the farm. These farms had 1,061,304 total acres and 98,903 harvested cropland acres of which 32,035 were irrigated and harvested. Rock County, in 1997, had 80 farms with irrigated acres. The 80 farms totaled 116,459 acres, 48,669 harvested cropland acres and 40,925 irrigated and harvested acres.

The 1997 Census of Agriculture was used as an indicator of the primary crops grown in each of the three counties. The primary crops produced in Brown County included corn, soybeans, hay and a small amount of oats. Cherry County crops included corn, wheat, oats, soybeans, dry edible beans, and hay. Corn and hay were the most common crops produced in Cherry County. Rock County had corn, soybeans, and hay as their primary crops.

The market value of agricultural products sold (average per farm) came to $250,341 for Brown County, $149,226 for Cherry County, and $176,043 for Rock County in 1997. In that same year, the total average market value of all agricultural products sold came to $87.369 million, $100.28 million, and $55.629 million for Brown, Cherry, and Rock Counties, respectively.

Nebraska Agricultural Statistics

Information about the number of harvested acres of irrigated crops in the three-county area was obtained from the annual Nebraska Agricultural Statistics publication. This source was also used for information about crop yields and price received. A five-year average of the data was used to determine baseline crop acreage, yield and price received.

Table 1 shows the irrigated crops that were produced in the three-county area (Brown, Cherry, and Rock Counties) from 1997-2001 and the number of acres of each crop that were harvested.

Crop and County	ACRES HARVESTED 1997	1998	1999	2000	2001	5-YEAR AVG
Corn Grain (bu)						
Brown	43,700	39,900	37,700	34,000	32,600	37,580
Cherry	12,200	10,900	9,700	10,300	10,200	10,660
Rock	27,600	24,000	18,200	20,200	18,900	21,780
Corn Silage (ton)						
Brown	2,900	2,400	2,500	1,900	1,600	2,260
Cherry	2,100	1,900	2,600	2,400	2,100	2,220
Rock	N/A	N/A	N/A	500	N/A	N/A
Soybeans (bu)						
Brown	3,300	3,000	5,600	7,000	10,000	5,780
Cherry	N/A	N/A	N/A	1,100	700	900
Rock	10,000	11,700	14,700	14,700	16,400	13,500
Alfalfa Hay (ton)						
Brown	2,300	2,400	2,500	2,400	2,600	2,440
Cherry	11,500	12,500	13,000	11,000	9,100	11,420
Rock	1,400	1,300	1,400	1,400	1,100	1,320

Table 1. Primary Irrigated Crop Acreages for Brown, Cherry, and Rock Counties in Nebraska, for 1997-2001

Corn is the most commonly produced crop in Brown and Rock Counties, accounting for 78 percent and 60 percent of all irrigated crops grown in Brown and Rock Counties, respectively. Cherry County had more alfalfa hay acreage than corn acreage. Corn in Cherry County accounted for 42 percent of all crops grown while alfalfa hay accounted for 45 percent. Soybeans were a commonly produced crop in Rock County, accounting for 37 percent of irrigated crops grown. Crop yields were also obtained for each of the above crops. These are shown in Table 2.

Crop	CROP YIELD 1997	1998	1999	2000	2001	5-YEAR AVG
Corn Grain (bu)						
Brown	144.0	157.0	154.0	149.0	149.0	150.6
Cherry	159.0	141.0	160.0	147.0	169.0	155.2
Rock	141.0	147.0	150.0	156.0	160.0	150.8
Corn Silage (ton)						
Brown	20.0	21.5	19.0	18.0	19.0	19.5
Cherry	18.0	18.5	19.0	18.0	20.0	18.7
Rock	N/A	N/A	N/A	19.0	N/A	
Soybeans (bu)						
Brown	53.0	54.0	56.0	52.0	52.0	53.4
Cherry	N/A	N/A	N/A	45.0	47.0	46.0
Rock	52.0	48.0	52.0	50.0	49.0	50.2
Alfalfa Hay (ton)						
Brown	3.29	4.6	3.6	4.0	4.0	3.9
Cherry	3.6	4.0	4.18	3.7	4.4	3.98
Rock	3.31	3.7	4.5	4.5	3.9	3.98

Table 2. Crop Yields for Brown, Cherry, and Rock Counties in Nebraska, 1997-2001

The prices by crop are shown in Table 3. This is a weighted-average, state level price published by the Nebraska Agricultural Statistics Service.

Crop	PRICE RECEIVED 1997	1998	1999	2000	2001	5-YEAR AVG
Corn Grain (bu)	$2.32	$1.88	$1.75	$1.90	$2.00	$1.97
Corn Silage (ton)	$23.20	$18.80	$17.50	$19.00	$20.00	$19.70
Soybeans (bu)	$6.28	$4.83	$4.47	$4.44	$4.20	$4.84
Alfalfa Hay (ton)	$79.50	$49.50	$39.00	$71.50	$74.00	$62.70

Table 3. Prices Received by Crop, 1997-2001

Irrigation Benefits

Irrigation benefits for the Ainsworth Unit are estimated were estimated using a farm budget methodology for National Economic Development (NED) benefits as prescribed by The "Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies" (Principles and Guidelines).

Methodology

National Economic Development (NED) evaluations assess national agricultural benefits from water resources projects. NED benefits are equal to the value of the net increase in agricultural production for

the nation as a whole and/or the cost savings of maintaining output at a given level. All irrigation benefits derived in this analysis occur at the farm level. Reported benefits include both per-acre values and total values for lands within the study area.

Derived benefits are measured through a farm budget analysis that shows changes in net farm income under “with” and “without” project conditions. The “with” project condition reflects the current cropping patterns and productivity of the lands. The “without” condition reflect the estimated changes in cropping patterns and productivity if the surface irrigation water were unavailable for use.

The purpose of using the “with” and “without” project budgeting exercise is to estimate a base value (per acre or per acre-foot (AF)) for the income forgone to the local economy and the nation as irrigation water become available.

Once the base value for income forgone, or lost benefits, has been estimated, the change in benefits between alternatives can be measured. The change in benefits is derived by multiplying the base value by the number of affected acres (or AF) under differing circumstances.

The change in benefits is driven by the changes in irrigation water deliveries. The lost benefits calculation transforms the change in water deliveries from a physical measurement (AF) to a monetary measurement (dollars).

National Economic Development Evaluations

The "Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies" (Principles and Guidelines) state the Federal planning rate is to be used in NED evaluations of irrigation benefits.

Basic crops are used in a NED analysis. Basic crops are those grown in sufficient quantities throughout the United States so that a water resources project would not affect the price received for a crop and cause a transfer of crop production from one area to another. Nationally, the availability of suitable land primarily limits the production of basic crops. Basic crops include rice, cotton, corn, soybeans, wheat, milo, barley, oats, hay, and pasture, according to the Principle’s and Guidelines, Section 2.3.2b.

Farm Budget Analysis

Farm budgets, based on Bureau of Reclamation procedures, were used to determine irrigation benefits. Farm budgets provide a systematic method for deriving costs, revenues, and net farm income.

Farm expenses include all costs related to the production of agricultural products, except water costs, which are accounted for outside the budgeting process. The sale of agricultural products generates revenues (or gross farm income) for the farm. Subtracting farm expenses from gross farm income defines net farm income. Allowances are then made for a return to the operator’s management skill, and labor. Subtracting these allowances from the net farm income yields a residual farm income that is used in calculating benefits from a surface-irrigation water supply.

Sources of Data

This study is being completed subsequent to the completion of payment capacity and ability-to-pay studies. All inputs costs, farm size assumptions, cropping patterns, yields, machinery complements, and labor assumptions are the same as those shown in the earlier studies. Specifics relating to any of the above-mentioned assumptions can be reviewed in the payment capacity studies.

Conceptually, however, there are major differences between payment capacity studies and irrigation benefit studies. These differences are summarized in Table 4 below. Following that, in Table 5, the differences in assumptions for variables specific to the representative farm are summarized.

		BENEFITS	PAYMENT CAPACITY
A.	Type of Analysis	Economic	Financial
B.	Farm Budgets Required	AWith@ Project vs. AWithout@ Project	AWith@ Project Only
C.	Time Period Represented	Entire Project Life	Year 1 of Repayment (or Years 1-5)
D.	Procedures	*Principles and Guidelines* (Mandatory)	Reclamation Manual (discretionary)
E.	Authority for Exceptions	Secretary of the Interior	Commissioner, Reclamation
F.	Geographic Focus	The Nation	the Project (local)

Table 4. Methodological Differences between Irrigation Benefits and Payment Capacity Studies

Ainsworth Irrigation District (AID)

Irrigation benefits for the AID were developed using the Principles and Guidelines methodology and "with" and "without" project farm budgets. The "with" and "without" farm budgets were based on the typical farms developed for the payment capacity studies previously completed for AID, but were adjusted for the study purpose. Under the "with" project conditions, the farm budgets reflect the current operating conditions. The "without" project budgets reflect the expected changes in cropping patterns in the event that surface irrigation water becomes unavailable. Table 6 shows the selected cropping patterns for the "with" and "without" project conditions.

		BENEFITS	PAYMENT CAPACITY
A.	Prices Received	USDA – Derived Current Normalized Prices (backup: 3-year state average)	3-year or 5-year local or state average
B.	Crops	Intensification benefits for 10 basic crops. Efficiency benefits for other.	Actual crops grown
C.	Livestock	Generally not allowed (use market value of feed)	Actual livestock enterprise
D.	Farm Size	Can be projected to change over project life Min: Actual expected Max: RRA limit	Projected to year 1 of repayment Min: Full employment Max: Actual
E.	Crop Yields	Can be projected over project life (but no increase past year 25)	Projected to year 1 of repayment
F.	Interest on Investment	Use Federal discount rate applied to all investment (opportunity cost)	Debt portion: use local or state interest rate Equity portion: use national rate of return to ag. sector
G.	Management Allowance	6 percent of variable production expenses	10 percent of net farm income

Table 5. Specific Farm Budget Differences between Irrigation Benefits and Payment Capacity Studies

	WITH PROJECT CROPPING PATTERN			
	Acres	Crop Yield	Yield Units	Price Received
Irrigated Crops				
Corn	391	159.3	Bu	$2.02
Alfalfa	11	4.6	Ton	$64.50
Estab. Alfalfa	2	1.0	Ton	$64.50
Soybeans	98	50.7	Bu	$4.75
Corn Silage	70	23.40	Ton	20.20

	WITHOUT PROJECT CROPPING PATTERN			
	Acres	Crop Yield	Yield Units	Price Received
Dryland Crops				
Corn	456	70.0	Bu	$2.02
Soybeans	114	15.0	Bu	$4.75

Table 6. Typical Farm Cropping Patterns for the "With" and "Without" Project Conditions, Ainsworth Irrigation District

Cropping Pattern and Yields

Under the "with" project conditions, the typical farm reflected in the farm budgets has a combination of irrigated crops. This cropping pattern is identical to the one shown in an earlier payment capacity study, as are the yields for the identified crops.

When the "without" project conditions are imposed on the typical farm, surface irrigation water is unavailable. Overall, farm size remains constant, as does the number of cropped acres. Acres previously irrigated are split on a percentage basis into corn and soybeans. Thus, the 570 previously irrigated acres are divided into 456 acres of corn and 114 acres of soybeans.

Yields used in the analysis were county averages for non-irrigated crops. Yields were obtained from the Nebraska Agricultural Statistics publication..

Prices Received

A benefit study uses current-year, normalized prices for the basic crops included in the study. For included crops having no reported normalized prices, a 3-year average of state-level price is used. On the "with" project budget, normalized prices were available for both corn and soybeans. The normalized price received for corn was $2.02 per bushel and $4.75 for soybeans.

Interest Rates and Interest Expenses

Interest rates used in a benefits study are set at the current-year Federal discount rate. For 2003, the base year of this analysis, the Federal discount rate was 5.125 percent. Interest expenses are computed on 100 percent of assets, as set forth in the Principles and Guidelines.

Farm Expenses

All crop expenses, other than interest rates and debt/equity ratios were taken directly from the previously completed payment capacity study. A complete discussion concerning these expenses is available in that study. Livestock expenses are not allowed in a benefits study, therefore, this expense category was excluded from the benefits study. Given that livestock are not allowed in a benefits study, the pasture land associated with the typical farm is treated strictly as a crop. Thus, net income from pasture is generated when the pasture is rented at prevailing prices, minus relevant expenses associated with pasture (e.g., fencing costs).

Farm Budget Allowances

Farm budget allowances included in a benefits study include a return to management and a return to labor. The return to management is calculated as 6 percent of total variable operating costs. A return to labor is calculated in the same manner as in a payment capacity study, where the hours of labor times the prevailing labor rate become the return to labor.

Per-Acre and Total Irrigation Benefits

Irrigation benefits are computed by taking the absolute difference between residual, per-acre net income under a "with" project condition and residual, per-acre net income under a "without" project condition. After deriving the value of the per-acre benefits, this value is multiplied by the appropriate number of acres in the district.

For AID, under the "with" project condition, gross farm income was $185,293 and total farm expenses were $187,540, leaving a net farm income of -$2,247. Subtracting the return to management ($6,175) and return to labor ($24,345) results in a residual net income of -$32,766. Dividing by 600 acres (570 irrigated acres plus 30 farmstead acres) gives the per-acre residual net income of -$54.61.

The "without" project budget had a gross revenue of $72,601 and $105,436 in total expenses, giving a net farm income of -$32,835. Subtracting the return to management ($2,613) and return to labor ($13,479) results in a residual net income of -$48,927. Dividing by the total farm size of 600 acres gives a per-acre value of -$81.55

Irrigation benefits are the absolute difference between the "with" project residual net income (-$54.61/acre) and the "without" project residual net income (-$81.55/acre) or $26.94 per acre.

Results of the Study

Three Alternatives were examined to satisfy the environmental requirements of the process. Under each Alternative studied, hydrologic model outputs were used in calculating annual irrigation benefits values and comparing them to the No Action Alternative. The hydrologic comparison of irrigation water deliveries was performed for an average over the period of record and for the 10th percentile and the 90th percentile of deliveries over the period of record. When perusing the results in Table 4, remember that deliveries will be greater than the value shown 90 percent of the time when you are looking at the 10th percentile results. Deliveries will be greater than the value shown 10 percent of the time when looking at the values for the 90th percentile.

It should be noted that cross-comparisons between the average, 10th percentile and 90th percentile are not done. For example, the No Action Alternative's average year is not compared to the Increased Water Supply Alternative's 10th percentile results or the Fish and Wildlife Alternative's 90th percentile scenario. Instead, the 10th percentile results are compared across each Alternative, and the 90th percentile results are compared across each Alternative. Lost benefits are estimated as the change in benefits from the No Action Alternative to the selected Alternative using the appropriate percentile (average, 10th or 90th) for each Alternative.

After deriving the annual irrigation benefits, the net present value of lost irrigation benefits was calculated using a 40-year time horizon and the current Federal discount rate of 5.125 percent.

Under the No Action Alternative, 49,170 AF of water were delivered to farms within the AID, on average. This equates to 1.42 AF per acre if the base acreage of 34,539 acres (project lands currently served) is used. Therefore, the base annual irrigation benefit is $930,481 ($26.94 per acre times 34,539 acres), rounded to $930,000. The base annual irrigation benefit can be transformed into a per AF basis by dividing $930,000 by 49,170 AF. When this is done, the benefit on a per AF basis is $18.91 for the analysis

If the Alternative being compared to the No Action Alternative yields a higher water supply than the No Action Alternative, there will not be an adverse economic impact. If the selected Alternative yields a lower irrigation water supply, the economic impact can be calculated by multiplying each Alternative's water supply by the $18.91 per AF and then finding the difference. For example, under the No Action Alternative, 49,170 AF of water is delivered to the farms on average. Under the Continue Irrigation With Increased Base Water Supply Alternative 51,319 AF of water is delivered to farms on average. There is no adverse economic impact to irrigators because the Increased Base Water Supply Alternative benefits the farmers by delivering more water to the farms.

When comparing the No Action Alternative to the Fish and Wildlife Alternative, average irrigation water deliveries decrease from 49,170 AF to 45,446 AF. There is an adverse impact to farmers because of the decreased water supply. To calculate the average annual benefits lost, multiply 45,446 acre-feet by

$18.91 per AF to get $859,000 in calculated benefits under the Fish and Wildlife Alternative. The difference between the calculated irrigation benefits from the No Action Alternative ($930,000) and the Fish and Wildlife Alternative ($859,000 rounded) gives an estimate of the annual lost benefits. The annual lost benefit in this example comes to $930,000 minus $859,000 = $71,000. The net present value of the average annual lost benefits of $71,000 over a 40-year horizon at the Federal discount rate of 5.125 percent, comes to $1,198,000.

Table 7 shows irrigation deliveries to the farms for the average, the 10th percentile, and the 90th percentile over the period of record. Also shown is the number of acre-feet per acre, the calculated irrigation benefits and the change in irrigation benefits on an annual basis.

Alternative	Hydrologic Percentile	Deliveries (AF)	AF/AC	Calculated Benefits	Annual Difference In Benefits
No Action	Average	49,170	1.42	$ 930,000	
	10th	37,660	1.09	$ 712,000	
	90th	62,180	1.80	$1,176,000	
Irrigation	Average	51,319	1.49	$ 971,000	$41,000
	10th	39,960	1.16	$ 756,000	$44,000
	90th	63,880	1.85	$1,208,000	$32,000
Fish, Wildlife, & Recreation	Average	45,446	1.32	$ 859,000	($71,000)
	10th	37,660	1.09	$ 712,000	$ 0
	90th	53,240	1.54	$1,007,000	($169,000)

Table 7 - Farm Deliveries by Percentile, Base Annual Irrigation Benefits by Alternative and Annual Lost Benefits by Alternatives When Compared to the No Action Alternative.

As can be seen in Table 7 under the No Action Alternative, 49,170 acre-feet of irrigation water was delivered to farms on average. Under the 10th percentile, farm deliveries dropped to 37,660 acre-feet. Farm deliveries increased to 62,180 acre-feet under the 90th percentile.

Under the Increased Water Supply Alternative, farm deliveries increased for the average, 10th percentile, and 90th percentiles. Thus, no lost irrigation benefits were sustained when compared to the No Action Alternative.

For the Fish, Wildlife, and Recreation Alternative, decreases in annual farm deliveries were sustained for the average and the 90th percentile. These annual lost benefits came to $69,000 and $166,000 for the average and the 90th percentile, respectively.

The present worth of the annual lost benefits is calculated by assuming a 40-year time horizon (based on the length of contract). The interest rate used in an NED benefits study is the Federal discount rate; currently 5.125 percent. The net present worth of the lost benefits for the Fish, Wildlife, and Recreation Alternative, on the average, is $1,164,000. The present worth of lost benefits for this Alternative under the 90th percentile is $2,851,000.

Appendix B: Nebraska Game and Parks Commission Fish Survey Results on the Snake River Below Merritt Dam 1973-1997

	RECORD_NO	925	922	926	924	4288
	STREAM	Snake River	Snake River	Snake River	Snake River	Snake River
	BASIN	Niobrara	Niobrara	Niobrara	Niobrara	Niobrara
	WATERSHED	Snake River	Snake River	Snake River	Snake River	Snake River
	COUNTY	Cherry	Cherry	Cherry	Cherry	Cherry
	DATE	25-Jul-89	18-Aug-82	10-Oct-89	18-May-89	07-Sep-73
	LONGITUDE	-100 49 02.0	-100 49 02.0	-100 49 02.0	-100 49 02.0	-100 51 25.0
	LATITUDE	42 44 30.0	42 44 30.0	42 44 30.0	42 44 30.0	42 40 30.0
	LEGAL					se0831n30w
	LOCATION					at Falls
	COLLECTOR	NDEQ 2	NDEQ 12	NDEQ 2	NDEQ 2	NGPC 1973
	NOTES	NI3268	NI3268	NI3268	NI3268	
7	BIGMOUTH SHINER	0	0	0	0	0
5	BLACK BULLHEAD	0	0	0	0	0
2	BLACK CRAPPIE	0	0	0	0	0
245	BROWN TROUT	6	1	3	0	8
8	CARP	7	0	0	1	0
1	CHANNEL CATFISH	0	0	0	0	0
1	COMMON SHINER	0	0	0	0	0
2	GREEN SUNFISH	0	0	0	1	0
1	IOWA DARTER	0	0	0	1	0
12	LARGEMOUTH BASS	0	0	0	0	0
432	LONGNOSE DACE	85	45	27	74	1
1	PUMPKINSEED	0	0	0	0	0
111	RAINBOW TROUT	0	3	1	6	0
2	SAND SHINER	0	0	0	0	0
1	SMALLMOUTH BASS	0	0	0	0	0
1	STONECAT	0	0	1	0	0
1	WALLEYE	0	0	0	0	0
1	WHITE BASS	0	0	0	0	0
232	WHITE SUCKER	5	9	38	6	4
1	YELLOW PERCH	0	0	0	0	0

RECORD_NO	4932	923	4933	4548	4287
STREAM	Snake River	Snake River	Snake River	Snake River	Snake River
BASIN	Niobrara	Niobrara	Niobrara	Niobrara	Niobrara
WATERSHED	Snake River	Snake River	Snake River	Snake River	Snake River
COUNTY	Cherry	Cherry	Cherry	Cherry	Cherry
DATE	04-Oct-97	21-Jul-88	04-Oct-97	26-Jun-39	07-Sep-73
LONGITUDE	-100 51.091	-100 49 02.0	-100 51.470	-100 51 18.0	-100 52 25.0
LATITUDE	42 41.088	42 44 30.0	42 39.299	42 40 10.0	42 38 05.0
LEGAL					nw2931n30w
LOCATION	Below Kime place		USGS gage	w Simeon	below Merritt dam
COLLECTOR	Schainost, Wall, et al	NDEQ 1	Schainost, Wall, et al	R.E.Johnson, R.Walla	NGPC 1973
NOTES	Field notes in file	NI3268	Field notes in file	Sta.55	
7 BIGMOUTH SHINER	0	0	0	7	0
5 BLACK BULLHEAD	2	2	0	0	1
2 BLACK CRAPPIE	2	0	0	0	0
245 BROWN TROUT	156	71	0	0	0
8 CARP	0	0	0	0	0
1 CHANNEL CATFISH	0	0	0	0	1
1 COMMON SHINER	0	0	0	0	1
2 GREEN SUNFISH	0	0	0	1	0
1 IOWA DARTER	0	0	0	0	0
12 LARGEMOUTH BASS	11	0	0	0	1
432 LONGNOSE DACE	0	5	181	14	0
1 PUMPKINSEED	0	1	0	0	0
111 RAINBOW TROUT	90	0	11	0	0
2 SAND SHINER	0	0	0	2	0
1 SMALLMOUTH BASS	1	0	0	0	0
1 STONECAT	0	0	0	0	0
1 WALLEYE	0	0	0	0	1
1 WHITE BASS	0	0	0	0	1
232 WHITE SUCKER	106	16	45	3	0
1 YELLOW PERCH	0	0	0	0	1

Appendix C: Methodology for Determining Recreation and Socioeconomic Impacts

Prepared by Jonathan Platt, Economist,
U.S. Bureau of Reclamation

Recreation

This section presents information on both the recreation affected environment and environmental consequences upon recreation of each of the action alternatives as compared to the No Action Alternative.

Affected Environment

The Ainsworth Unit includes Merritt Dam and Reservoir, the Ainsworth Canal, and a system of laterals and drains. From a recreation perspective, the reservoir represents the primary recreation facility. In addition, reservoir operations can affect water based recreation on the Snake and Niobrara Rivers downstream of the dam.

Merritt Dam and Reservoir Merritt Dam and Reservoir is located in the heart of the Sandhills region of north central Nebraska, about 14 miles upstream of the confluence of the Snake and Niobrara Rivers. When full, at an elevation of 2946 feet above mean sea level, this scenic reservoir has a surface area of approximately 2905 acres and 44 miles of shoreline. Despite being an irrigation project, strong inflows from both the Snake River and Boardman Creek help reduce the risk of excessive drawdowns during irrigation season. Given the reservoir experiences only moderate water level fluctuation, recreation opportunities are seldom limited significantly by inadequate water levels. Recreation on and around the reservoir, within Merritt Reservoir State Recreation Area, is managed by the Nebraska Game and Parks Commission.

Recreation Activities and Facilities:

- Fishing: The reservoir offers some of the best fishing in the State, especially for walleye. The fishing season in this multi-species warm water fishery is year-round and, in addition to walleye, other game fish species include muskie, largemouth bass, smallmouth bass, white bass, crappie, yellow perch, channel catfish, bluegill, bullheads, and northern pike. Many of these species grow to trophy size as evidenced by several State and world records. As a result, fishing is the most popular recreational activity at the reservoir.

- Boating: Motorized boating, waterskiing, and sailing are also popular activities during the summer months. There are 5 boat ramps at the reservoir at Beeds Landing Campground, Cedar Bay Campground, Main Lake Campground, Powderhorn Campground, and Snake River Campground. The ramps at Beed's Landing and Cedar Bay are two-lane while the others are one. There is also a marina at the reservoir. The Merritt Trading Post area has rental boats but no private marina slips.

- Camping: Merritt Reservoir provides for both developed RV camping and undeveloped tent camping. There are 11campgrounds located at Merritt Trading Post, Main Lake, Cedar Bay, Beeds Landing, Boardman Creek, Snake River, Powderhorn, Pines, Cottonwood, Lone Tree, and Willow Cove. The last four are primitive campgrounds (tent sites only), while the others are developed and allow RVs. Camping is the second most popular recreational activity at the reservoir.

- Picnicking: There area nine picnic areas, two hundred picnic tables, and eight picnic shelters at various locations around the reservoir.

- Swimming: Despite the lack of officially designated beaches, naturally occurring sugar sand beaches are exposed as the reservoir is drawn down during mid- to late-summer, providing swimming opportunities.

- Hunting: The Commission manages the area not only for recreation, but also for fish and wildlife purposes as well. Hunting for waterfowl, small game, and big game is allowed during specified season within Merritt Reservoir State Recreation Area. Hunting is more popular in the R. McKelvie National Forest located directly north of and adjacent to the reservoir.

- Hiking: Some hiking activity occurs within the Merritt Reservoir State Recreation Area, but much more occurs in the R. McKelvie National Forest.

- Sightseeing: Given the scenic nature of the reservoir, some people visit primarily for sightseeing purposes.

Recreation Visitation and Value Table REC1 presents information on total visitation by year from 1995 to 2004. Across the 10 year period, total visitation per year averaged 133,500 visits. Recent data on visitation by recreation activity does not exist, however such data is available for 1989 to 1994. Using the percentages of visitation by recreation activity from 1989 to 1994 applied to the 1995 to 2004 annual visitation average, provides an estimate of current annual visitation by recreation activity. Based on this information, fishing and camping are the dominate activities comprising over 80% of the total. The top four activities – fishing, camping, boating (including waterskiing), and picnicking - reflect over 96% of total visitation.

In addition to the visitation information, Table REC1 also presents some preliminary estimates of economic values per visit by recreation activity. The economic values reflect the amount recreators would be willing-to-pay in excess of what they actually paid per visit. The values were obtained from a meta analysis study of recreation (Kaval and Loomis, 2003). The authors gathered economic value results by activity from hundreds of different travel cost and contingent valuation studies conducted from 1967 to 2003. The valuation results were averaged and presented by recreation activity and geographic region. Given the values from the Kaval and Loomis study were presented in 4th quarter 1996 dollars, they were indexed to December 2004 dollars based on the Midwest Region consumer price index. Applying these economic values by activity to the estimates of visitation by activity provides a preliminary indication of the total current economic value of recreation at Merritt Reservoir. Based on this information, total economic value was estimated at about $5.6 million annually.

Table REC1: Merritt Reservoir Recreation Visitation and Economic Value

Year	Total Visitors	Recreation Activity	Percent by Activity[1]	Estimated Visitation by Activity	Economic Value per Visit (1996 $)[2]	Economic Value per Visit (2004 $)[3]	Economic Value by Activity (2004 $)[3]
1995	149,162	Sightseeing	1.53	2,038	19.65	23.32	47,521
1996	146,674	Picnicking	6.98	9,317	23.56	27.96	260,449
1997	168,641	Camping	34.83	46,504	28.93	34.33	1,596,378
1998	133,880	Swimming	0.67	897	24.62	29.21	26,214
1999	142,275	Waterskiing	0.98	1,310	47.47	56.33	73,779
2000	130,585	Boating	7.07	9,443	44.73	53.08	501,205
2001	123,869	Fishing	46.53	62,120	41.31	49.02	3,044,961
2002	111,150	Hunting	1.38	1,846	40.46	48.01	88,634
2003	116,300	Other	0.02	24	46.96	55.72	1,350
2004	112,206						
10 Year Average:	133,500 (rounded)					**Total Economic Value:**	5,640,490 (rounded)

Notes:

1. Percent by Activity: Based on latest available visitation data by activity (1989 -1994) obtained from Reclamation Recreation and Wildlife Summaries.

2. Economic Value (1996$): From Kaval and Loomis, 2003.

3. Economic Value (2004$): Indexed 4th quarter 1996 values to December 2004 using Midwest Region consumer price index.

Snake River Flows on the lower section of the Snake River, downstream of Merritt Reservoir, are maintained by releases from Merritt Dam. Snake River falls, located downstream from the dam, is the largest falls in the state in terms of water volume despite being less than ten feet tall. Cold water releases from the dam has helped to create a well known brown trout fishery, the only trout fishery in the Sandhills region. Nevertheless, there is not much recreation activity on this stretch of the river since most of the lands are private and access is limited.

Niobrara River The Snake River merges with the larger Niobrara River several miles west of the town of Valentine, Nebraska. While not the only tributary of the Niobrara, fluctuations in the Snake River's controlled flows can affect flows on the lower Niobrara River. Recreation use of the Niobrara River downstream of Valentine is relatively heavy given this section has been designated a National Scenic River.

Seventy six miles of the Niobrara River, from the Borman Bridge near Valentine to the Highway 137 bridge north of Newport, were designated a National Scenic River in 1991. The river flows slowly in some sections and very quickly in others providing the only Class II+ rapids in the state of Nebraska. The

western third of the scenic river section, characterized by steep tree lined canyons and numerous tributary waterfalls, is very popular for canoeing, hiking, and sightseeing. In fact, Backpacker Magazine rated this section of the Niobrara as one of the top ten canoeing rivers in the country. The scenic river corridor consists of mostly private lands, but also includes the Fort Niobrara National Wildlife Refuge and Wilderness Area, Smith Falls State Park, and the Nature Conservancy's Niobrara Valley Preserve.

- Fort Niobrara National Wildlife Refuge and Wilderness Area (U. S. Fish and Wildlife Service): The 19,123 acre refuge and 4,635 acre wilderness area are located a few miles east of the town of Valentine. The refuge is a favorite put-in spot for canoeists. The sedate portion of the Niobrara, just east of the refuge, is popular for novice canoeists.

- Smith Falls State Park (Nebraska Game and Parks Commission): Established in 1992, this park is located east of the Fort Niobrara National Wildlife Refuge and Wilderness Area (15 miles east of Valentine) and provides canoeing and hiking access to Nebraska's tallest waterfall (70+ feet) amid a thick deciduous forest.

A few miles downstream of Smith Falls, flow speeds on the Niobrara increase considerably, resulting in several Class II+ rapids and portages providing a challenge even for experienced canoeists. Starting at the Fort Niobrara National Wildlife Refuge and exiting at Norden Bridge offers over 30 miles of prime canoeing. Beyond the Norden Bridge, the river becomes to shallow and unpredictable for further canoe travel.

- Niobrara Valley Preserve (Nature Conservancy): The 65,000 acre preserve, one of the largest owned by the Conservancy, is located northwest of Ainsworth. The preserve includes a 25 mile stretch of the Niobrara River.

Recreation Visitation and Value Table REC2 presents recent visitor data for the National Scenic River segment of the Niobrara River. This data was obtained from the three sites noted above plus "Other National Scenic River Areas" managed to some degree by the National Park Service. Given the limited data and the results of management actions in recent years, the decision was made to use the post year 2000 average as indicative of current visitation. Combining average visitation across the four areas results in an overall estimate of about 121,100 visits.

Table REC2: Niobrara National Scenic River Recreation Visitation and Economic Value

Year	Ft. Niobrara National Wildlife Refuge	Smith Fall State Park	Niobrara Valley Preserve	Other National Scenic River Areas	Combined Total Visitation
	Canoers/ Kayakers/ Tubers	Hikers	Canoers/ Kayakers/ Tubers	Canoers/ Kayakers/ Tubers	
I. Recreation Visitation:					
1994	23,971				
1995	26,608				
1996	31,179				
1997	31,748	74,389 [2]			
1998	27,619	81,934			
1999	23,408	77,377			
2000	17,497 [1]	66,188			
2001	16,525	80,632	10,000 [3]	22,842 [4]	129,999
2002	15,185	72,385	10,000	18,886	116,456
2003	13,993	73,421	10,000	25,692	117,685
2004	11,980	76,208	10,000	21,816	120,004
Post-2000 Average (rounded):	15,000	73,800	10,000	22,300	121,100
II. Economic Value:					
Value per Visit (1996 $) [5]	56.42	32.11	56.42	56.42	
Value per Visit (2004 $) [6]	66.95	38.10	66.95	66.95	**Total Annual Value:**
Annual Value:	1,004,300	2,811,800	669,500	1,493,000	$ 5,978,600

Notes:

1) After peaking in 1997, a significant drop in visitation occurred as a result of capping the number of outfitters and imposition of a restriction on alcohol. The alcohol restriction was not fully enforced until 2000.
2) While the park was established in 1992, visitation did not expand sharply until the foot bridge was completed in 1996.
3) The Nature Conservancy did not provide yearly visitation data, but estimated average annual river use at 10,000.
4) Visitation at "Other" National Scenic River sites was calculated by subtracting NWR data from NPS estimates.
5) Economic Value (1996 $): From Kaval and Loomis, 2003
6) Economic Value (2004$): Indexed 4th quarter 1996 values to December 2004 using Midwest Region consumer price index

Table REC2 also presents preliminary estimates of economic value. Economic values per visit were again obtained from Kaval and Loomis (2003) and indexed to December 2004 dollars using the Midwest region consumer price index. Applying these 2004 values per visit to the estimated visitation by activity provides a preliminary indication of the total current economic value of recreation within the Niobrara National Scenic River corridor. Using this information, total economic value along this stretch of the river is estimated at nearly $6 million annually.

Environmental Consequences

This section presents the consequences to recreation of implementing either the Increased Base Water Supply (Irrigation) Alternative or the Fish, Wildlife, and Recreation Alternative. All impacts are determined by comparing results for each "action" alternative to the baseline or No Action Alternative. Impacts associated with each action alternative are measured in terms of facility availability, recreation visitation, and economic value. Given the effects of the action alternatives on instream flows for the Niobrara River were deemed to be relatively insignificant, the focus of the recreation analysis is on Merritt Reservoir.

Facility Availability Impacts to Merritt Reservoir recreation facility availability were measured by comparing end of month (EOM) water levels by alternative to the high and low end usability thresholds for each of the boat ramps. Admittedly, by working off of EOM water levels, this analysis is somewhat simplistic given that it cannot account for daily water level fluctuations. Nevertheless, the analysis does provide a general indication of variation in facility availability between alternatives. Other primarily land based recreation facilities around the reservoir were assumed not to be significantly affected by fluctuating water levels. As noted under the recreation affected environment section, Merritt Reservoir currently has five boat ramps at the following locations: Cedar Bay, Beeds Landing, Snake River, Powderhorn, and Main Lake campground. Differences in hydrologic conditions for each alternative were measured by comparing facility availability during average conditions, dry conditions (10th percentile of water levels), and wet conditions (90th percentile of water levels). Given dry and wet conditions each only occur ten percent of the time, facility availability during average conditions is emphasized. In addition, the analysis focuses on facility availability during the high recreation season from May through September since better than 85 percent of the annual recreation visitation typically occurs during those months. Table REC3 presents the results of the facility availability analysis. Differences in facility availability between the action and the no action alternatives are capitalized and bolded in the table.

Table REC3: Boat Ramp Availability by Month and Alternative

Boat Ramp	Bottom of Ramp	Top of Ramp	Apr	May	June	July	Aug	Sept
Alternative #1: No Action Alternative:								
Average Condition Water Levels:			2946.3	2946.0	2945.8	2938.3	2929.6	2932.1
Cedar Bay	2931.9	2952.5	yes	yes	yes	yes	no	yes
Beeds Landing	2930.3	2948.3	yes	yes	yes	yes	no	yes
Snake River	2934.0	2949.2	yes	yes	yes	yes	no	no
Powderhorn	2933.5	2950.1	yes	yes	yes	yes	no	no
Main Lake	2935.5	2953.3	yes	yes	yes	yes	no	no
Dry Condition Water Levels:			2945.5	2946.0	2945.5	2934.5	2922.7	2925.7
Cedar Bay	2931.9	2952.5	yes	yes	yes	yes	no	no
Beeds Landing	2930.3	2948.3	yes	yes	yes	yes	no	no

Snake River	2934.0	2949.2	yes	yes	yes	yes	no	no
Powderhorn	2933.5	2950.1	yes	yes	yes	yes	no	no
Main Lake	2935.5	2953.3	yes	yes	yes	no	no	no
Wet Condition Water Levels:			2946.8	2946.0	2946.0	2943.3	2936.5	2936.3
Cedar Bay	2931.9	2952.5	yes	yes	yes	yes	yes	yes
Beeds Landing	2930.3	2948.3	yes	yes	yes	yes	yes	yes
Snake River	2934.0	2949.2	yes	yes	yes	yes	yes	yes
Powderhorn	2933.5	2950.1	yes	yes	yes	yes	yes	yes
Main Lake	2935.5	2953.3	yes	yes	yes	yes	yes	yes
Alternative #2: Increased Water Supply (Irrigation) Alternative								
Average Condition Water Levels:			2946.3	2946.0	2945.8	2938.2	2928.6	2931.2
Cedar Bay	2931.9	2952.5	yes	yes	yes	yes	no	***NO***
Beeds Landing	2930.3	2948.3	yes	yes	yes	yes	no	yes
Snake River	2934.0	2949.2	yes	yes	yes	yes	no	no
Powderhorn	2933.5	2950.1	yes	yes	yes	yes	no	no
Main Lake	2935.5	2953.3	yes	yes	yes	yes	no	no
Dry Condition Water Levels:			2945.5	2946.0	2945.4	2935.3	2920.9	2923.9
Cedar Bay	2931.9	2952.5	yes	yes	yes	yes	no	no
Beeds Landing	2930.3	2948.3	yes	yes	yes	yes	no	no
Snake River	2934.0	2949.2	yes	yes	yes	yes	no	no
Powderhorn	2933.5	2950.1	yes	yes	yes	yes	no	no
Main Lake	2935.5	2953.3	yes	yes	yes	no	no	no
Wet Condition Water Levels:			2946.8	2946.0	2946.0	2943.2	2935.8	2935.8
Cedar Bay	2931.9	2952.5	yes	yes	yes	yes	yes	yes
Beeds Landing	2930.3	2948.3	yes	yes	yes	yes	yes	yes
Snake River	2934.0	2949.2	yes	yes	yes	yes	yes	yes
Powderhorn	2933.5	2950.1	yes	yes	yes	yes	yes	yes
Main Lake	2935.5	2953.3	yes	yes	yes	yes	yes	yes
Alternative #3: Fish, Wildlife, and Recreation Alternative								
Average Condition Water Levels:			2946.3	2946.0	2945.8	2938.1	2932.1	2934.1
Cedar Bay	2931.9	2952.5	yes	yes	yes	yes	***YES***	yes
Beeds Landing	2930.3	2948.3	yes	yes	yes	yes	***YES***	yes
Snake River	2934.0	2949.2	yes	yes	yes	yes	no	***YES***
Powderhorn	2933.5	2950.1	yes	yes	yes	yes	no	***YES***
Main Lake	2935.5	2953.3	yes	yes	yes	yes	no	no
Dry Condition Water Levels:			2945.5	2946.0	2945.5	2934.4	2929.0	2931.2
Cedar Bay	2931.9	2952.5	yes	yes	yes	yes	no	no
Beeds Landing	2930.3	2948.3	yes	yes	yes	yes	no	yes
Snake River	2934.0	2949.2	yes	yes	yes	yes	no	no
Powderhorn	2933.5	2950.1	yes	yes	yes	yes	no	no
Main Lake	2935.5	2953.3	yes	yes	yes	no	no	no
Wet Condition Water Levels:			2946.8	2946.0	2946.0	2943.3	2936.5	2936.3
Cedar Bay	2931.9	2952.5	yes	yes	yes	yes	yes	yes
Beeds Landing	2930.3	2948.3	yes	yes	yes	yes	yes	yes
Snake River	2934.0	2949.2	yes	yes	yes	yes	yes	yes

Powderhorn	2933.5	2950.1	yes	yes	yes	yes	yes	yes
Main Lake	2935.5	2953.3	yes	yes	yes	Yes	yes	yes

Based on end of month reservoir water levels during the high recreation season from May (EOM April) through September (EOM September), No Action Alternative boat ramp availability under average conditions indicated a lack of boat ramp availability during August. Under No Action Alternative dry conditions, boat ramps show up as being unavailable during both August and September. Under wet conditions, all ramps show as being available across all months.

The only difference in boat ramp availability between the Increased Water Supply (Irrigation) Alternative and the No Action Alternative occurs during average conditions for the month of September. The Cedar Bay boat ramp becomes unavailable under the Increased Water Supply (Irrigation) Alternative. It is possible that this reduction in availability of the Cedar Bay ramp might not significantly impact recreation visitation given that another ramp (i.e., Beeds Landing) shows up as being available for that month. No differences resulted between the No Action and the Irrigation Alternative during dry and wet conditions.

The Fish, Wildlife, and Recreation Alternative results in additional boat ramp availability under average conditions as compared to the No Action Alternative during the months of August and September. During August, the impact of two additional ramps (i.e., Cedar Bay and Beeds Landing) may prove more significant than the additional ramp availability in September given the lack of ramp availability in August for the No Action Alternative. Under dry conditions, the Fish, Wildlife, and Recreation Alternative shows additional availability of a single ramp (i.e., Beeds Landing) in September. This additional ramp availability may prove to be somewhat important given the lack of September ramp availability for the No Action Alternative. On the other hand, this dry condition impact is likely to prove less significant as compared to the increase in ramp availability during average conditions given dry conditions occur only about 10 percent of the time. No difference in ramp availability showed up during wet conditions.

Recreation Visitation and Economic Value Impacts to Merritt Reservoir recreation visitation were measured using a statistical use estimating model. The model predicts total annual recreation visitation as a function of start of season (April) EOM water levels, the change in water levels from April to September, and population within 150 miles of the reservoir. The overall model proved statistically significant. In addition, the explanatory or independent variables were all statistically significant and of the expected sign. Data for estimation of the model was obtained from 1980 to 2004. Plugging into the model alternative specific information on water levels allows for development of annual visitation estimates by alternative and hydrologic condition. Information on the distribution of visitation by recreation activity and economic values per visit were presented in the recreation affected environment section. Combining the model based visitation results by alternative with the per visit economic values allows for estimation of total recreation economic value by alternative. Table REC4 presents information on both visitation and recreation economic value by alternative, as well as the differences in visitation and value between the action and no action alternatives. In addition, relevant information on the statistical model are presented at the end of the table.

For No Action Alternative average condition, the model estimated annual visitation at about 133,000 and value at $5.62 million. As would be expected, the model predicted lower levels of visitation (and value) for dry conditions and higher levels for wet conditions.

The Increased Water Supply (Irrigation) Alternative was estimated to result in slightly lower levels of visitation and value under all three hydrologic conditions. Under average conditions, the loss in visitation and value compared to the No Action Alternative was 1.5 percent. The losses in visitation and value was considered minor under each hydrologic condition.

The Fish, Wildlife, and Recreation Alternative was estimated to result in somewhat higher levels of visitation and value under average and dry hydrologic conditions. The gains in visitation and value, while greater in both absolute and percentage terms compared to the losses associated with the Increased Water Supply (Irrigation) Alternative, were still considered relatively minor under each hydrologic condition. Note that the approximately 12 percent increase in visitation and value associated with the Increased Water Supply (Irrigation) Alternative under dry conditions would only occur 10 percent of the time thereby reducing its level of significance.

Table REC4: Recreation Visitation and Economic Value

Alternative/Hydrologic Condition	Visitation Estimate	Change in Visits from No Action	Percent Change in Visits from No Action	Economic Value	Change in Value from No Action	Percent Change in Value from No Action
No Action Alternative:						
Average Conditions	133,007	n/a	n/a	$5,619,660	n/a	n/a
Dry Conditions	111,525	n/a	n/a	$4,712,030	n/a	n/a
Wet Conditions	147,298	n/a	n/a	$6,223,470	n/a	n/a
Increased Water Supply (Irrigation) Alternative:						
Average Conditions	131,011	(1,996)	(1.50)	$5,535,330	(84,330)	(1.50)
Dry Conditions	107,374	(4,151)	(3.72)	$4,536,650	(175,380)	(3.72)
Wet Conditions	146,185	(1,113)	(0.76)	$6,176,440	(47,030)	(0.76)
Fish, Wildlife, and Recreation Alternative:						
Average Conditions	137,849	+ 4,842	+ 3.64	$5,824,240	+ 204,580	+ 3.64
Dry Conditions	124,870	+ 13,345	+ 11.97	$5,275,870	+ 563,840	+ 11.97
Wet Conditions	147,298	0	0	$6,223,470	0	0
Statistical Use Estimating Model:			(Dependent Variable: Annual Visitation)			
Independent Variables	Coefficient	t-ratio	Significance of t-ratio	F-Statistic	Significance of F-Statistic	Adjusted R^2
Starting Water Level	+10270.6	2.184	.040	4.9975	.009	.333
Change in Water Level	-2421.9	-2.395	.026			
150 Mile Population	+0.920	1.916	.069			
Intercept	-30603792.6	-2.225	.037			

Socioeconomics

This section presents information on both the socioeconomic affected environment and environmental consequences upon socioeconomics of each of the action alternatives as compared to the No Action Alternative.

The intent of socioeconomic or regional economic impact analysis is to describe the total economic activity within a given geographic area. While numerous measures of economic activity could be considered, the following three measures were used in this analysis:

- Industry Output: Dollar value of production (sales revenues or gross receipts) from each industry.
- Employment: Total of part-time and full-time hourly wage, salary, and self-employed jobs.
- Place of Work Income: Employment income (wages and benefits) derived at the workplace - including self-employed income.

Affected Environment

This section presents information on current economic activity within the potentially affected region surrounding the Ainsworth Unit. The region encompassing the reservoir, canal, and associated agricultural lands is defined by the three counties of Cherry, Brown, and Rock in north central Nebraska.

Table SOCIO1 presents information from 2001 on output, employment, and place of work income for the three county region. This data was obtained from the widely used IMPLAN input-output model. IMPLAN generates information across 509 economic sectors, these sectors were combined into 20 aggregated industries for presentation purposes. Overall, the three county region generated nearly $560 million in output, 7100 jobs, and $128 million in place of work income in 2001.

Table SOCIO1: Regional Economic Activity (Output, Employment, and Income)

Base Year: 2001
Region: Cherry, Brown, and Rock Counties, NE

Aggregated Industry	Industry Output*	%	Employment (Jobs)	%	Place of Work Income*	%
Agriculture, Forestry, & Fishing	268	47.9	1,955	27.5	17	13.3
Mining	0.4	0.1	4	0.1	0.2	0.2
Utilities	3.4	0.6	32	0.5	0.8	0.6
Construction	32.9	5.9	471	6.6	11.8	9.2
Manufacturing	44.7	8.0	182	2.6	6.7	5.2
Wholesale Trade	15.1	2.7	263	3.7	5.7	4.4
Transportation & Warehousing	7.9	1.4	92	1.3	3	2.3
Retail trade	34.5	6.2	859	12.1	13.8	10.8
Information	1.9	0.3	8	0.1	0.7	0.5
Finance & insurance	14.8	2.6	88	1.2	3.7	2.9
Real Estate & Rental/Leasing	1.5	0.3	46	0.6	0.3	0.2
Professional - Scientific & Tech Services	7.9	1.4	306	4.3	5.1	4.0
Management of Companies	0	0.0	0	0.0	0	0.0
Administrative/Support & Waste Mgt Services	4.5	0.8	188	2.6	1.6	1.2
Educational Services	1	0.2	172	2.4	0.1	0.1
Health & Social Services	15.9	2.8	386	5.4	9.3	7.3
Arts, Entertainment & Recreation	1.3	0.2	50	0.7	0.5	0.4
Accommodation & Food Services	15.4	2.8	405	5.7	6.2	4.8
Other Services	25.1	4.5	402	5.7	8.2	6.4

Government		63.8	11.4	1,189	16.7	33.5	26.2
	Totals:	559.9		7,099		128.1	

*Millions of dollars

The agriculture industry dominates the region in terms of output and is also the largest industry from an employment perspective. However, government provides the most within region income. Other relatively influential industries include retail trade and construction.

Environmental Consequences

Operations of Merritt Dam and Reservoir were not estimated to produce significant changes in agricultural output or recreation activity under either the Increased Water Supply (Irrigation) Alternative or the Fish, Wildlife, and Recreation Alternative. As a result, no significant changes in economic activity are expected within the region.

Reference

Kaval, P. and J. Loomis. 2003. "Updated outdoor recreation use values with emphasis on National Park Recreation." Department of Agricultural and Resource Economics, Colorado State University, Ft. Collins, CO. Report submitted to National Park Service.

Appendix D: Draft Environmental Assessment Distribution List

FULL NAME	COMPANY
NATIONAL AUDUBON SOCIETY	
NATURAL RESOURCES DEFENSE COUNCIL, INC	
AMERICAN RIVERS	
THE CONSERVATION FOUNDATION	
NATIONAL WATER RESOURCES ASSOC	
SIERRA CLUB MIDWEST	
THE NATURE CONSERVANCY	MIDWEST REGIONAL OFFICE
DUANE BIG EAGLE, CHAIRMAN	CROW CREEK SIOUX TRIBE OF THE
MICHAEL B. JANDREAU, CHAIRMAN	LOWER BRULE SIOUX TRIBE
WILLIAM KINDLE, PRESIDENT	ROSEBUD SIOUX TRIBE
HAROLD FRAZIER, CHAIRMAN	CHEYENNE RIVER SIOUX TRIBE OF THE CHEYENNE
JOHN YELLOW BIRD STEELE, TRIBAL PRES.	OGLALA SIOUX TRIBE OF THE PINE RIDGE RESV.
CHARLES MURPHY, CHAIRMAN	STANDING ROCK SIOUX TRIBE
TEX G. HALL, CHAIRMAN	THREE AFFILIATED TRIBES
ARLYN HEADDRESS, CHAIRMAN	FORT PECK ASSINIBOINE AND SIOUX TRIBES
SUPERINTENDENT	BUREAU OF INDIAN AFFAIRS, WINNEBAGO AGENCY
RON KLATESKA	NATIONAL AUDUBON SOCIETY
MICHAEL ADAMS	SNAKE FALLS SPORTSMEN CLUB
DONALD GRANT, CHAIRMAN	OMAHA TRIBE OF NEBRASKA
JOHN BLACKHAWK, CHAIRMAN	WINNEBAGO TRIBE OF NEBRASKA
NATURE CONSERVANCY	NEBRASKA FIELD OFFICE
DIRECTOR, REGION 2	NATIONAL PARK SERVICE
NEBRASKA AUDUBON COUNCIL	
NE SIERRA CLUB	
IONE WERTHMAN	AUDUBON NEBRASKA
MIKE SANDS	NATIONAL AUDUBON SOCIETY
BOB PUSHENDORF	NE HISTORIC PRESERVATION OFFICE
NE STATE HISTORICAL SOCIETY	
ROB SCHUPBACH	CORNHUSKER FLY FISHERS AND TROUT UNLIMITED
LARRY HUTCHINSON	NE GAME AND PARKS COMMISSION
REX AMACK, DIRECTOR	NE GAME AND PARKS COMMISSION
JIM DOUGLAS	NE GAME AND PARKS COMMISSION
UPPER ELKHORN NRD	
DOUG CHRISTENSEN	NRCS
LINDA WEISS	U.S.G.S.
RON MORELAND, DIRECTOR	NRCS
DEMARIS JOHNSON, EXECUTIVE DIRECTOR	NE WATER RESOURCES ASSOC.
RICH KERN	NE NATURAL RESOURCES COMMISSION
ANN BLEED	NE DEPARTMENT OF NATURAL RESOURCES
RANDOLPH WOOD, DIRECTOR	NE DEPARTMENT OF ENVIRONMENTAL QUALITY
TIM KNOTT	AUDUBON NEBRASKA
JOE HYLAND	DUCKS UNLIMITED
TOM ZIMMER	NE GAME AND PARKS COMMISSION
BEN RUTTEN, DIST MGR	NE GAME AND PARKS COMMISSION
JOEL KLAMMER	NE GAME AND PARKS COMMISSION
LOWER NIOBRARA NRD	

MARK PENISKA, JR., CHAIRMAN	PONCA TRIBE OF NEBRASKA
ROGER TRUDELL, CHAIRMAN	SANTEE SIOUX TRIBE OF NEBRASKA
PAUL HEDREN	NIOBRARA NATIONAL SCENIC RIVER
STEVE ANSCHUTZ	U.S. FISH AND WILDLIFE SERVICE
PATRICE BARNEY	US FOREST SERVICE
BRENT JOHNSON	AINSWORTH IRRIGATION DIST.
CLEVE TRIMBLE	LANDOWNER
RODNEY VERHOEF	SCENIC RIVER COUNCIL
MIDDLE NIOBRARA NRD	
ROYCE HUBER	FT NIOBRARA / VALENTINE
AL STEUTER	THE NATURE CONSERVANCY
RODERICK IMM, MANAGER	AINSWORTH IRRIGATION DISTRICT
CHESTER WILKINS	AINSWORTH IRRIGATION DISTRICT
DONALD FLING	AINSWORTH IRRIGATION DIST.
KEVIN HEIKKILA	NEBRASKA NATIONAL FOREST
LYNN VOGT	UPPER NIOBRARA-WHITE NRD
GEORGE E. HOWELL, PRESIDENT	PAWNEE TRIBE OF OKLAHOMA
A LIONEL LECLAIR, CHAIRMAN	PONCA TRIBE OF OKLAHOMA
J. PATRICK STOUT	LANDOWNER

Attachments

Attachment 1: Ainsworth Unit, Nebraska (Map No. 719-705-2)—Front

Attachment 2: Merritt Reservoir Land Cover

Attachment 3: Ainsworth Irrigation District Land Cover

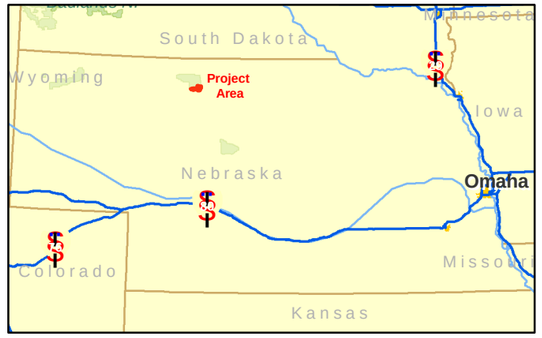
Attachment 4: Merritt Reservoir Regional Land Cover

Attachment 5: Merritt Reservoir Wetlands Inventory Data

Attachment 6: Ainsworth Irrigation District Wetlands Coverage

Attachment 7: Merritt Reservoir Public Use Areas

Attachment 2
Merritt Reservoir
Land Cover



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Legend

- Reservoir Boundary
- Grassland/Rangeland/Pasture 4,983 acres
- Pine Forest 286 acres
- Riparian Forest and Woodlands 528 acres

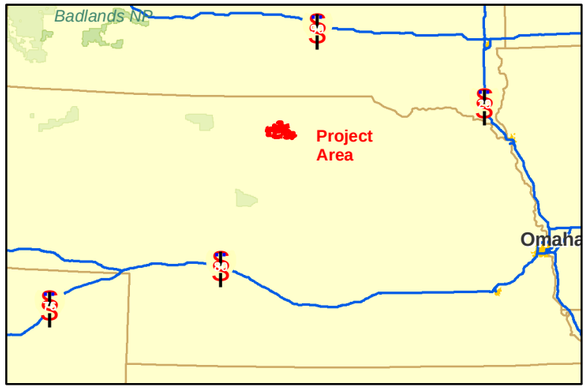
Data from CALMIT

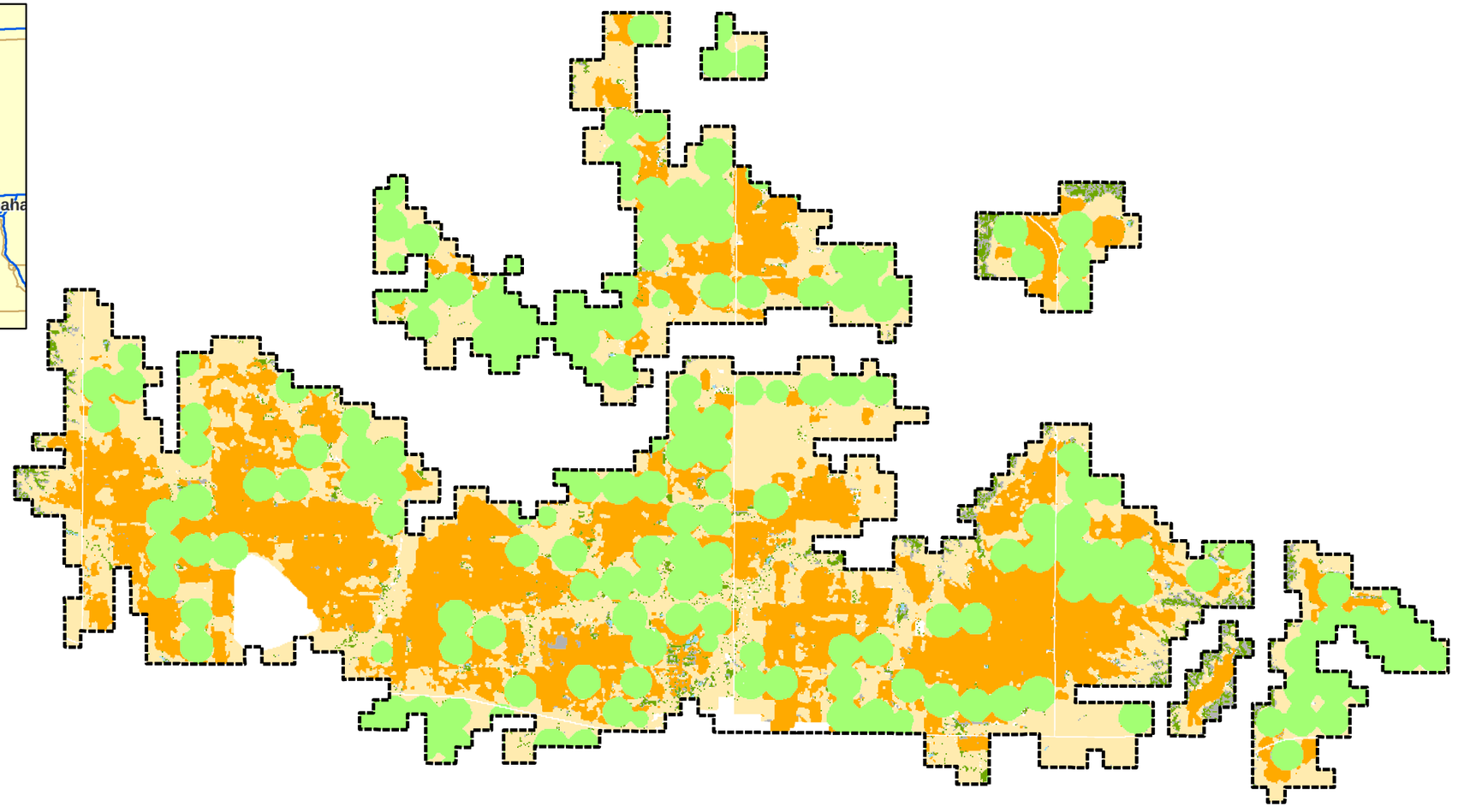
0 0.5 1 2 3 Miles

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

Attachment 2
Merritt Reservoir
Land Cover 3-30-06

Attachment 3
Ainsworth Irrigation District Land Cover





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Legend

- 1970 Irrigation District Boundary
- Dry Land Row Crop
- Grassland/Rangeland/Pasture
- Irrigated Row Crop
- Pine Forest
- Riparian Forest and Woodlands
- Water

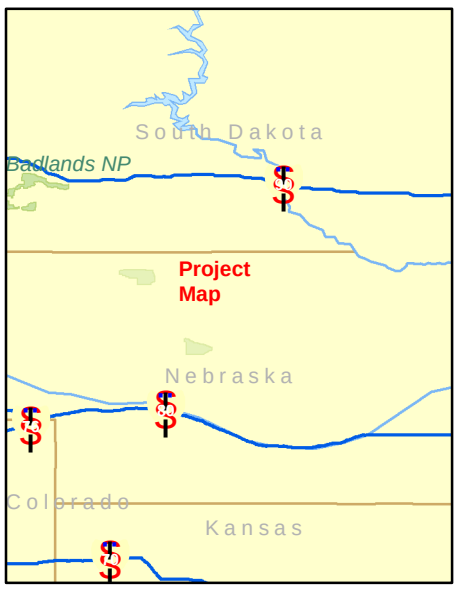
Data from CALMIT

0 1.5 3 6 9 Miles

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

Attachment 3
Ainsworth Irrigation
District Land Cover 3-30-06

Attachment 4
Merritt Reservoir
Regional Land Cover



Legend

- Reservoir Boundary
- Major Roads

Landcover

- Dry Land Row Crop
- Grassland/Rangeland/Pasture
- Irrigated Row Crop
- Pine Forest
- Riparian Forest and Woodlands
- Water

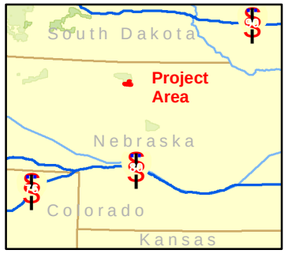
Data from CALMIT

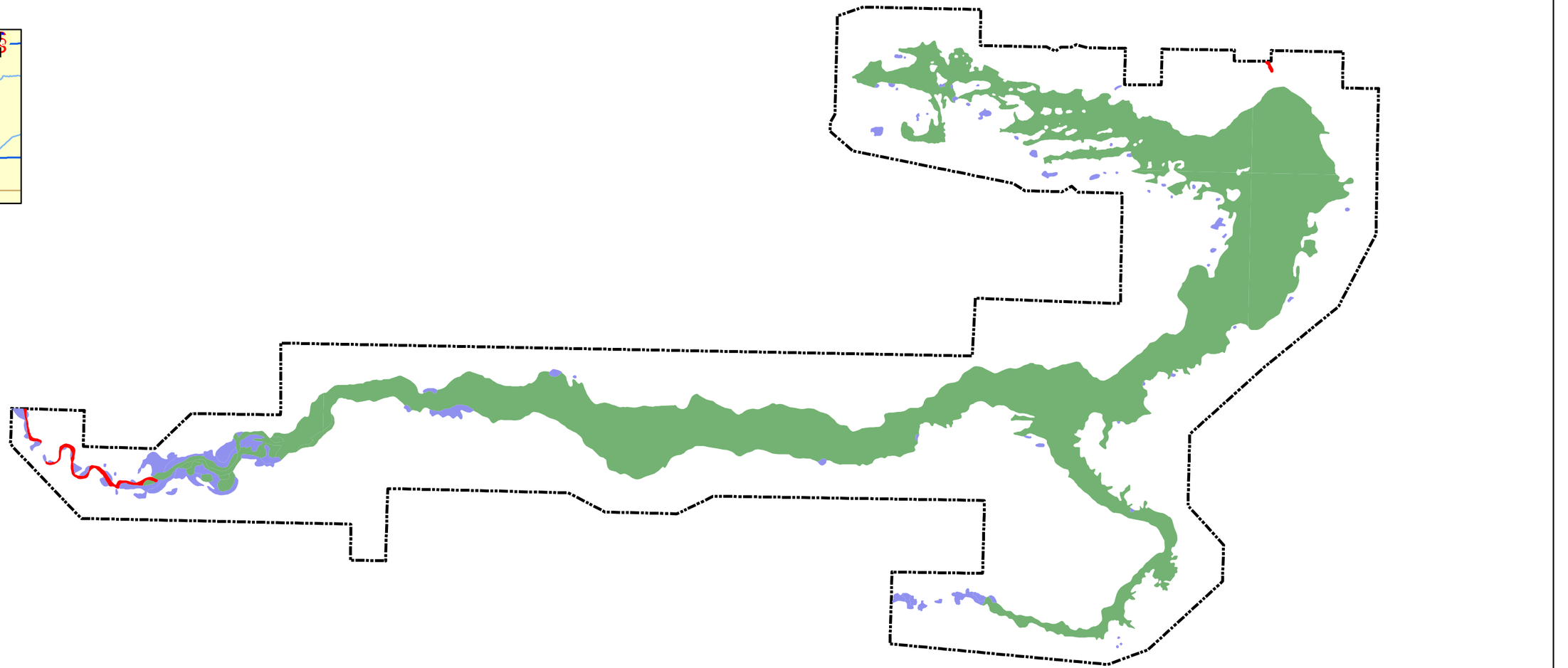
0 0.5 1 2 3 4 Miles

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

Attachment 4
Merritt Reservoir
Regional Land Cover 3-30-06

Attachment 5
Merritt Reservoir
Wetlands Inventory Data





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Legend

Reservoir Boundary

Lucustrine 2591.7 Acres

Palustrine 157.9 Acres

Riverine 20.8 Acres

Data from US Fish & Wildlife Services

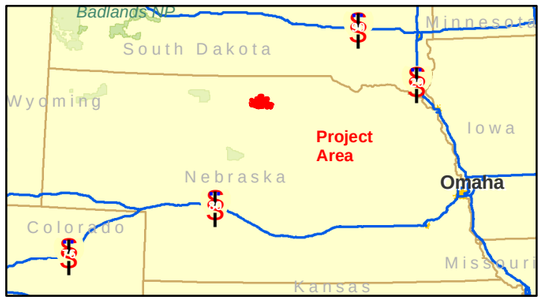
0 0.45 0.9 1.8 2.7 Miles

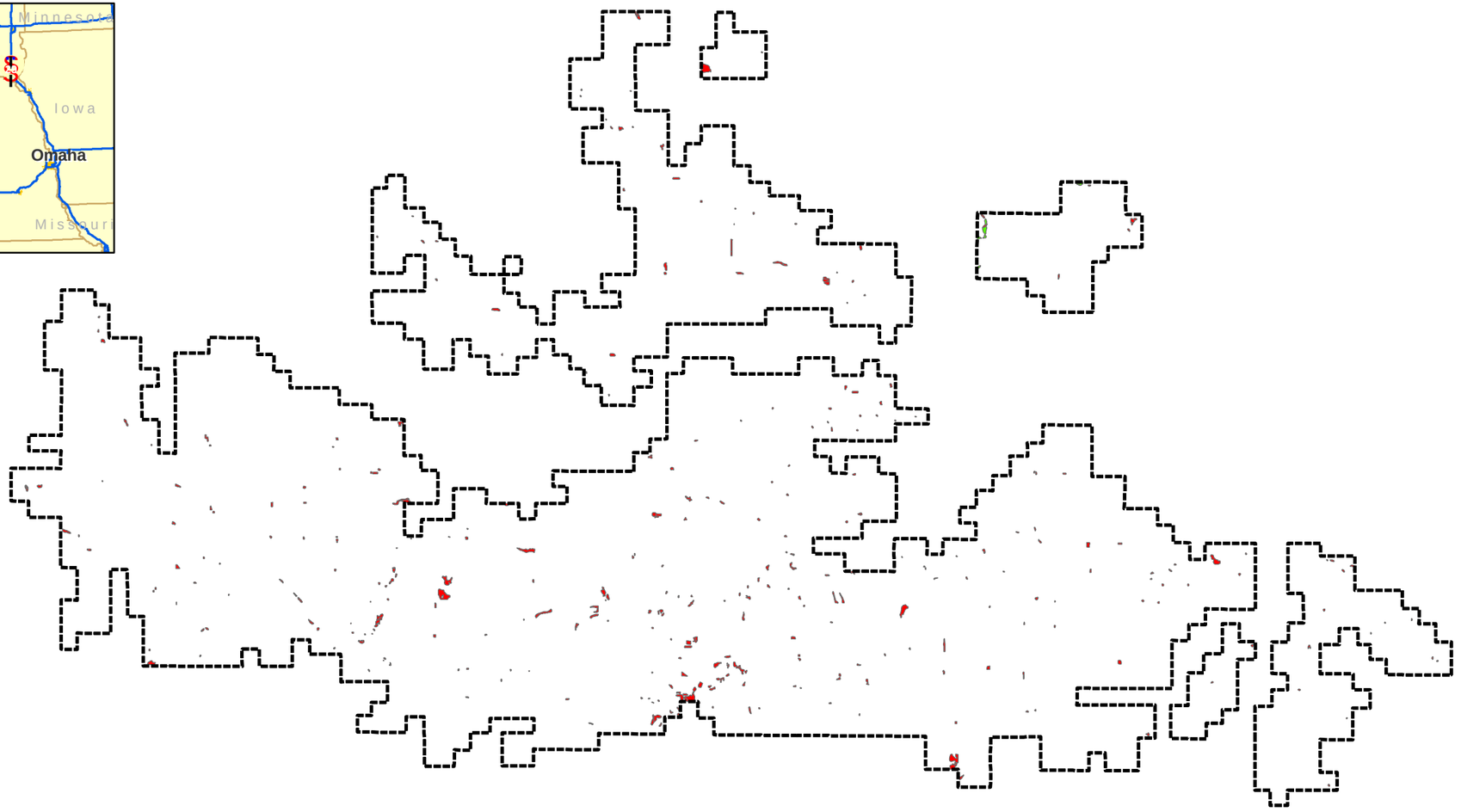
U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

U.S. FISH & WILDLIFE SERVICE

Attachment 5
Merritt Reservoir
Wetlands Inventory Data 3-30-06

Attachment 6
Ainsworth Irrigation District Wetland Coverage





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Legend

-------- 1970 Irrigation District Boundary

Wetlands

	Palustrine	298 Acres
	Riverine	21 Acres

Data from US Fish and Wildlife Services

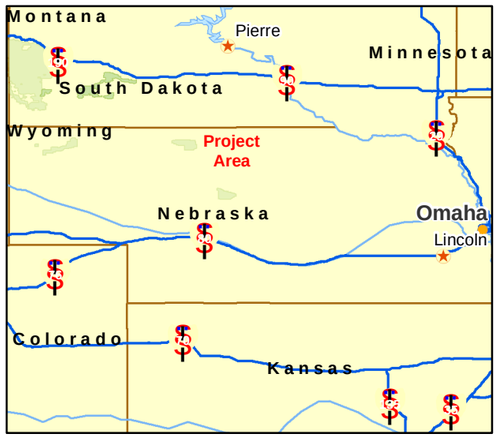
0 1.25 2.5 5 7.5 Miles

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

U.S. FISH & WILDLIFE SERVICE

Attachment 6
Ainsworth Irrigation District
Wetland Coverage 3-30-06

Attachment 7
Merritt Reservoir
Public Use Areas



1 Powderhorn Area
y

2 Reservoir Superintendent

3 Concession Area
£ ¶ ³ = Û ¼

4 NGPC Headquarters
@ »

5 Main Area
² y 3 _ Û <

6 Willow Cove Area
9 _ ² <

7 Fishermen Access

8 Lone Tree Area
9 <

9 Cottonwood Area
9 _ <

10 Pines Area
³ <

11 Cedar Bay Area
² _ 3 < p y

12 Beed's Landing Area
² _ 3 y < Û

13 Boardman Creek Area _ ²

14 Snake River Area
² _ 3 y <

15 Cable Hill Area

¶

² Water Well
_ 2-Sided Pit Toilet
£ Boat Storage
y Boat Ramp
3 Store/ Supplies
¼ Camping W/ Hookups
< Camping
= Cabins
¶ Laundry Facilities
@ NGPC Headquarters
3 Picnic Shelter
Û Fish Cleaning Station
» Dumping Station
p Showers
9 Camper Registration

Legend

- Reservoir Boundary
- Roads
- Conservation Pool 2946.0 - 2896.0
- Inactive Pool 2896.0 - 2875.0
- Dead Pool 2875.0

Data from CALMIT

0 0.5 1 2 3 Miles

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

Attachment 7
Merritt Reservoir
Public Use Areas 3-30-06